An integrated framework for clinical education:
Situating practice in the classroom

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Statement of Originality

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Katherine Alison Proudfoot
I would like to take the opportunity to thank my supervisor Professor Alison Ferguson for her enthusiasm and guidance. Her insightful comments have always challenged and motivated me and have greatly enhanced the quality of my work.

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Abstract

In a departure from traditional approaches to learning which often heighten the divide between theory and practice, this thesis proposes that the core aim of health science courses is to foster the emerging development of professional artistry to a level of competency sufficient for students to enter the workforce. The development of professional artistry is a complex, multifaceted process which requires the integration of theoretical knowledge in practice, development of a professional identity and recognition of the influence that past experience, both personal and professional, has on each student’s learning and understanding of practice. Recognising the development of professional artistry as the core educational goal requires a reassessment of how best to facilitate learning. Implicit in adopting this view of learning is the recognition that the authenticity of learning contexts is essential for ensuring that theoretical knowledge is sufficiently integrated with clinical practice. The context of learning must also situate theoretical knowledge into authentic clinical scenarios in a manner that encourages role taking to foster the development of professional identity. In this thesis an educational framework is proposed that describes both individual and social processes of learning and how they combine to facilitate the development of professional artistry. The challenge of how to situate learning in authentic contexts outside of clinical placements is discussed through the development of an online learning module based on an integration of principles of authentic learning, situated learning and instructional design. The importance of learning in authentic contexts was explored by examining the influence of context on the performance of 44 psychology students and 43 speech pathology students when they independently completed the online learning module. Results indicated that exposure to the online learning module resulted in a significant improvement in test performance for speech pathology students but no significant difference in performance for psychology students. The role of collaborative learning in facilitating the development of professional artistry was also explored by examining interactions between a second-year, third-year and fourth-year student when paired with a clinical educator to complete the online learning module. Research revealed important insights into the role of socialisation and interaction in the development of professional artistry and how this process evolves as student experience increases. Future research directions and implications for education are discussed.
Chapter 1: Learning, Expertise and Clinical Education

“Artistry grows out of a way of knowing and seeing that is informed by theory, 
enabled by competence in action, and shaped by personal experience.”

(Beeston & Higgs, 2001, p. 115)

1.1 Introduction

In recent years the development of professional artistry has been recognised as an important benchmark of advanced clinical skills. As the above quote suggests, the development of professional artistry is a complex, multifaceted process involving the integration of theoretical and clinical knowledge that is informed by both clinical and personal experience. For clinicians, the task of integrating such broad knowledge bases can be daunting especially given that there are limited explanations or frameworks available to guide them through this process. These dilemmas also extend to supervisors who have the task of facilitating the development of professional artistry with only an emerging literature available on the types of supervisory approaches which may foster the development of these skills.

The journey towards developing professional artistry starts much earlier than when clinicians first enter the workforce. Consequently, any framework for the development of professional artistry must also describe the complex educational process of facilitating the evolution from student to clinical practitioner. The combination of academic, personal and clinical learning experiences that students are exposed to are likely to continue to shape their development of professional artistry long after they have graduated as entry level clinicians.

In this thesis it is proposed that the current lack of suitable learning frameworks to describe the development of professional artistry occurs because it requires an integration of multiple types of knowledge that cannot be adequately captured by most contemporary theories of learning, expertise and practice when examined in isolation. Whilst current theories of learning provide insight into how learners may acquire theoretical knowledge, they often neglect the role of personal growth and professional identity in learning, and provide little guidance to educators on how to teach the student to actively apply their knowledge as a clinical practitioner. Similarly, many theories of expertise identify signs of competence in practice
however, their methodology predominantly focuses on contrasting performances of experts and novices without providing information about how to facilitate the journey from novice to expert. Furthermore, for educators, the focus is not on developing experts, but on facilitating the transition from student to competent entry level practitioner. The entry level practitioner will naturally have different benchmarks of competency and possibly employ different transitional learning processes than experts.

Another concern is that both theories of learning and theories of expertise do not give adequate recognition to the considerable role of clinical practice in shaping clinical knowledge and therefore provide limited insight to educators into the learning processes which allow their students to develop professional expertise in these unique learning environments (Walker, 2001).

Whilst recognising that developing artistry is a lifelong professional journey, this thesis is an exploration of how educators can sow the seeds for development as they facilitate the transition from student to entry level practitioner. When examining contemporary views of expertise in health professionals, terms such as ‘professional artistry’, ‘connoisseurship’, ‘integrated knowledge base’ and the ability to engage in ‘client-centred practice’ are all prominent in the current literature (Beeston & Higgs, 2001; Jensen, Gwyer, Hack & Shepard, 1999). Whilst they all have a slightly different emphasis, the commonality is the recognition of the seamless way that proficient clinicians are able to select, integrate, prioritise and apply their knowledge on a case by case basis. The question of how to teach students to select, synthesise and transfer knowledge in a manner that is clinically useful is of central concern to educators. So too is the question of how to select and synthesise academic and clinical components of courses in a manner that fosters deep integrated learning and avoids the pitfalls of a theory and practice divide.

This thesis has developed from this need to develop a new educational framework that can better account for the complex learning processes involved in the development of professional artistry and guide educators in how to create meaningful learning situations in the classroom. The specific research aims were:

1. To develop an integrated educational framework to describe how individual and social learning processes may combine to facilitate learning and the development of professional artistry.
2. To explore current perspectives on authentic learning and use these principles to guide the development of an online learning module (OLM).
3. To explore clinical educators’ perspectives on authenticity as they relate to the OLM.
4. To evaluate the learning outcomes of the OLM when used for individual self-directed study.

5. To investigate learning interactions when more or less experienced individual students used the OLM with a clinical educator.

This chapter begins with a review of contemporary contributions to theories of learning and expertise and how they may inform the development of a new educational framework. This is followed by a section on professional practice and clinical education that addresses the unique aspects of learning to become a health professional. In the final section, discussion focuses on what clinical educators can draw from research to inform educational practice. Particular emphasis is placed on discussing some of the current tensions relating to learning approaches emphasising the primacy of the individual versus the primacy of the community as the core facilitators in the transition from student to beginning practitioner.

In Chapter 2 the key findings of this discussion are applied to the development of an educational framework to describe the learning processes involved in becoming a professional. One of the key elements within this framework is the need to provide students with authentic learning opportunities that require them to integrate and apply their knowledge in a manner that reflects the realities of clinical practice. Chapter 3 continues discussion on how to develop realistic learning opportunities by exploring contemporary views on authentic learning, and then applies these principles to the development of an online learning module as an example of how curricular design may facilitate learning within the proposed educational framework.

Chapter 4 provides an overview of the rationale and methodology for this study. The research involved three stages: the validation of an online learning module; a study of students independently completing the online learning module; and a study of students completing the learning module whilst being supported by a clinical educator. The methodology and subsequent results of these three stages are examined in greater detail in Chapters 5, 6 and 7 respectively. Finally, Chapter 8 provides an integrated discussion of the research findings with reference to the proposed educational framework, the current literature and suggestions for future research directions.

1.2 Theories of Learning

Developing an understanding of the processes underpinning learning is essential for educators to enable them to provide students with educational experiences that maximise learning opportunities. The study of learning is complicated by the variety of learning areas currently being researched using a number of different methodologies (Bransford, et al., 2006). For example, research has focused on new skill acquisition, the impact of learning on
developing schema and transferring knowledge, and how interaction impacts on learning. Added to this is the variety of settings in which research takes place including laboratories, preschools, schools, the community, the home and the workplace. Timeframes for studies also vary from a few seconds to longitudinal studies spanning many years.

Much like the theory-practice divide that has been at the centre of debate in research and education in clinical health sciences, there are also considerable differences of opinion amongst learning theorists with regard to the role of the individual and processes of socialisation as mechanisms for learning. In this section contemporary approaches to learning are explored with reference to theories that emphasise the individual and theories that consider socialisation as the core learning process. Discussion then focuses on how theories of learning may contribute to educators’ understanding of the unique learning demands and environments encountered when teaching students to become health professionals.

1.2.1 Theories of Learning Emphasising the Individual

Walker (2001) provides an overview of how theories of learning have changed continually to reflect the dominant views in psychology and education at the time. Initially theories reflected the influence of behaviourist approaches with a focus on the individual passively adapting to the environment through processes of association where behaviour was explained by the mechanisms of conditioning and reinforcement. By the 1950s there was a conceptual shift to perceive learning as a much more active process of acquiring knowledge. Learning involved information processing where the individual selects information from the environment, processes the information and then assimilates the new knowledge with their existing knowledge (Walker, 2001). In this perspective all the understanding an individual accumulates over time is a result of the individual’s interpretation of experience (von Glasserfeld, 1984).

Constructivist approaches whilst also emphasising the active role of the individual do not see knowledge as being obtained from the external environment. In contrast, constructivist approaches see knowledge generation as a process that occurs through the individual interacting with the environment (Walker, 2001). Knowledge therefore cannot be transmitted directly from teacher to learner because the learner must actively build up their own knowledge (Driver, Asoko, Leach, Mortimer, & Scott, 1994).

Piaget is an example of a well-known constructivist. His theory has its roots in the evolutionary nature of knowledge acquisition. Knowledge was seen as an entity that is either useful and therefore enables adaption, or not useful (Piaget, 1978). Piaget was interested in how useful knowledge is developed and incorporated into an individual’s existing knowledge. The
viability of specific types of knowledge was considered to be closely linked to the evolutionary term ‘equilibrium’. From an evolutionary perspective this term relates to an organism having reached a point where genetic survival in a particular environment is assured. Similarly, when used in a cognitive sense, equilibrium refers to a state where a person’s cognitive structures continue to produce expected results and there are no contradictions in the data that is produced (Piaget, 1978; Von Glasersfeld, 1989).

Two concepts are essential to an understanding of Piaget’s theory of cognition: assimilation and accommodation (Piaget, 1978). Assimilation refers to the incorporation of new knowledge. Accommodation refers to the adjustments to existing knowledge that need to be made to allow the incorporation of this new knowledge. Both these terms need to be understood in conjunction with the concept of schemas. Schemas consist of three parts: recognition of a situation; association of the situation with a kind of item; and expectation of a particular result (Von Glasersfeld, 1989). Von Glasersfeld (1989) gives the following example to explain the situation in more detail. When an expected result does not occur (for example, a baby picks up a spoon and shakes it like a rattle — but the spoon does not make any noise), a perturbation occurs which is the basis for cognitive change. When this perturbation occurs there is the potential for accommodation to occur. In the case of the above example accommodation could be minor (spoons are not rattles) or major such as while shaking the spoon, the baby accidentally hits the spoon on the table and is rewarded with a noise (also a perturbation although a much more positive one for the baby!) and then develops a whole new spoon banging schema (Von Glasersfeld, 1989). Piaget’s theory asserts that learning takes place through schemas where unexpected results occur, leading to perturbations which result in accommodation and a new equilibrium (Von Glasersfeld, 1989). Von Glasersfeld (1989) cautions that such a view can lead to over-simplistic interpretations of Piaget’s theory. Sensory-motor level action schemas help the individual to achieve goals in the world. However, at the reflective abstraction level, operative schemas assist the individual to develop conceptual networks that allow thinking as well as action. Sensory-motor level schemas tend to be utilitarian, while reflective abstraction level schemas are cognitive. Learning occurs through the cognitive reorganisation that occurs when these schemas encounter perturbations. Whilst emphasising that learning occurs through the cognitive reorganisation of the individual, the approach also recognises that many of the perturbations encountered by individuals are a result of interacting with other individuals (Von Glasersfeld, 1989).

There are two key areas where constructivist approaches have been applied to pedagogy. The first approach emphasises the role of the individual and how they, as an individual, construct meaning from the world. Classroom planning from this perspective focuses
on the practical design of learning materials to ensure that they challenge learners adequately to facilitate the reorganisation of their individual knowledge (Driver, Asoko, Leach, Mortimer, & Scott, 1994). Learners, therefore, may be given tasks which conflict with their existing knowledge to encourage them to re-evaluate and reorganise this existing knowledge to account for the information discovered through the learning tasks. Typically such tasks would also be accompanied by group discussions to facilitate this change through the portrayal of different perspectives. The role of teachers in this approach is to develop the learning materials and act as facilitators of reflection. Driver and colleagues (1994) criticise this approach as it underplays the importance of interactions with the symbolic resources such as language and cultural tools of the specific knowledge domain in the process of learning. They also point out that it is too simplistic to see learning as a process of constantly rewriting knowledge. Instead they argue that learning may consist of developing several parallel knowledge schemas in which concepts or multiple meanings of concepts are selectively applied to different contexts.

The second approach addresses some of these criticisms by shifting the emphasis to the process of being enculturated or apprenticed into a specific domain of knowledge, and how this process draws on, interacts and modifies the individual’s own knowledge (Driver, Asoko, Leach, Mortimer, & Scott, 1994). Learning in a new domain therefore involves learning different ways of thinking and becoming socialised within the practices of the community. However, to successfully learn and participate, each individual must personally construct these meanings (Driver, Asoko, Leach, Mortimer, & Scott, 1994). This new perspective led to the more contemporary concepts of pragmatic schemas and pragmatic reasoning which recognise that the individual’s schemas develop and operate within specific cultural contexts (Butterworth, 1992).

From a teaching perspective, taking a purely constructivist approach to learning can be problematic, especially when application of constructivist principles is reduced to “students construct their own knowledge” (Cobb, 1994a, p. 4). Under this view point Cobb (1994a) suggests that the role of teacher can be reduced to facilitator of student problem-solving rather than proactively communicating the ways of knowing that are associated with a particular subject area. He challenges this notion of constructivism, arguing instead that students can still potentially construct knowledge in highly directive classroom situations where information is being actively conveyed to them. He sees the critical issue not as whether students are constructing, but rather the quality of the learning situation in which students are constructing. Learning occurs within intellectual communities through a process of enculturation in the communities’ practices (Cobb, 1994a). Theories that place greater emphasis on the importance
of the community and socialisation as the primary mechanisms facilitating learning are explored in the following section.

1.2.2 Theories of Learning Emphasising Socialisation

Social Learning Theory (SLT) describes a group of theories which emphasise socialisation as the key mechanism for learning. The other common feature of these theories is that skills are not considered to be easily transferrable between contexts, and therefore students must learn in a manner that is congruent with how they will ultimately apply their knowledge. These theories emphasise the participatory, cultural and domain specific nature of knowledge and challenge theories of learning which highlight the individual nature of learning, knowledge and skill acquisition and the ability to generalise learning (Salomon & Perkins, 1998). The term culture is not easily defined but there are several commonalities between definitions. The essential nature of definitions is the shared or collective nature of knowledge which is connected to beliefs, values and behaviours which are commonly accepted within the group (Fitzgerald, 2001).

The development of new theories is often a reaction to dissatisfaction with current practices and their theoretical underpinnings. In the case of social and sociocultural theories of learning, the work of Brown, Collins and Deguid (1989) in the field of situated cognition is commonly cited as the starting point of research in this area, with acknowledgement of the contributions of the earlier work of Vygotsky (1920-34) which emphasised the vital role of interaction in learning, and Dewey (1902, 1939) who emphasised the importance of experiential learning though engagement in everyday activities that are meaningful to the child.

Vygotsky (1920-34) stressed the importance of engaging students in everyday experiences as a platform to facilitate learning. He believed that a structured approach to learning should prevail, where the student is facilitated to learn at a higher level than they are capable of independently achieving through active scaffolding provided by a more advanced member of the community. The difference in performance between the student’s independent level of attainment and the level of skill obtained when facilitated through a process of scaffolding was referred to as the zone of proximal development. The role of the students in this framework is to acquire the cultural knowledge presented to them through their guided participation in the activity. From a societal perspective the role of education is to foster greater abilities of students to participate more fully in the social activities and practices within the community (Glassman, 2001).

Early recognition of the importance of social interaction and learning through everyday practice can also be traced back to Dewey. His theories on education were a response
to dissatisfaction with the USA education system in the late 1800s and early 1900s. Of particular concern was the mechanical way subjects were passively taught to students, with little relationship between what occurred in the classroom and everyday life (Dewey 1902; Glassman, 2001). Dewey (1902) stressed the importance of engaging students in the everyday activities of their community as a way of developing knowledge through experiential learning. Unlike later sociocultural approaches, Dewey (1902) still stressed the role of the individual rather than the community in the process of learning. From his perspective, the individual learns through engaging in activities, and through solving challenges and problems contained within these situations. The individual’s newly acquired knowledge changes both their own thinking and practices of the community (Dewey, 1939). As an early pioneer of the philosophy of lifelong learning, Dewey considered that while the specifics of activities were important, learning to take individual responsibility to prioritise and solve problems presenting within these activities was considered a higher priority (Glassman, 2001). Dewey’s view, much like the constructivist approaches, was that being faced with new problems or information that does not fit the individual’s current knowledge base is vital because it creates a need for the individual to explore new ideas. It is through this exploration that the individual creates new knowledge that will ultimately advance not only the individual but the whole community (Dewey, 1939). In educational settings, teachers working within Dewey’s framework would take the role of facilitator rather than instructor to foster the active engagement of the individual in activities (Von Glasersfeld, 1989). However, both O’Brien (2002) and Glassman (2002) report that the degree to which the facilitator is actively involved in mentoring the learning of the individual within this framework remains an issue of debate.

The other key contributors to the contemporary study of the social mechanisms of learning were Brown and colleagues (1989). In the late 1980s they proposed a model of situated cognition to account for the processes of learning. In contrast to dominant theories of learning at the time, they argued that learning is contextually situated and that it is the activity, context and culture which ultimately influence what is learned by the individual. Their approach was originally a reaction to current education practices which they argued extracted knowledge from different subject areas and taught such subjects in manners so removed from the original knowledge contexts that students learnt skills for school success rather than the skills necessary to succeed beyond school. In their efforts to capture the types of activities considered optimal for learning, Brown and colleagues (1989) coined the term authentic environments which they commonly contrast with school environments. Authentic environments are those activities and settings which typically occur within a given culture. Brown and colleagues (1989) argue that in school environments, activities tend to be hybrid. For example, in the case of mathematics there is an attempt to expose students to the culture of mathematics (the attributed culture), but...
the framework in which the subject is presented (via classroom activities, text book exercises) is often not the type of authentic activity commonly engaged in by practitioners in the field (e.g. mathematicians). Therefore, because the activities are frequently so removed from the practices of the culture, students are not provided with the types of scaffolding, learning, and motivational support to facilitate successful completion of tasks that engagement in authentic activities provides.

Situated learning involves several key learning components which include cognitive apprenticeship, stories, reflection, collaboration, coaching, multiple practice, articulation of learning skills and technology (McLellan, 1996). Cognitive apprenticeship provides a learning mechanism which facilitates the development of knowledge within a defined domain of expertise. Participation in authentic practice through apprenticeship facilitates the acquisition and refinement of a student’s cognition through both the actual participation in authentic activities and the exposure to the stories and collaborative problem solving that are often employed to overcome presenting problems (Brown, Collins, & Duguid, 1989).

Situated cognition made considerable contributions to learning theory because it challenged educators to consider the importance of culture and the context of learning, rather than simply seeing it as a process of internalising knowledge. However, criticism also followed. One of the most fundamental criticisms was that all learning situations have a context, regardless of their authenticity. This led Lave and Wenger (1991) to extend the theory by arguing that it is not the context of an activity that is important, but rather that the activity occurs within the community of practice where the skill will ultimately be used. They proposed that all learning occurred within communities of practice. These communities were defined as groups of people working towards a common goal or sharing the same knowledge base, belief systems and consensus in what constitutes best practice within the community.

Lave and Wenger (1991) also described a mechanism for how learning occurs within a community of practice. They explained that learning is not the primary focus of the community; instead the goal is for socialisation to allow the individual to fully function within the community. Learningoccurs as a consequence of socialisation, however, the primary goal is for socialisation to maximise the individual’s participation. When a novice enters a community of practice, they tend to have a very peripheral role as they acquire knowledge about the beliefs and core tasks within the community. Their first types of participation typically involve observation and then completion of the simplest elements of tasks. Lave and Wenger (1991) gave the example of tailor apprentices initially learning to sew on buttons and make button holes, with the most critical (and difficult) tasks, such as cutting out a suit from a pattern, being participated in last. So new people start off by having peripheral roles in community activities
and then as their competency and independence increases they move towards taking more central roles in authentic practices within the community. Lave and Wenger (1991) described this process as legitimate peripheral participation (LPP). LPP challenged the traditional approaches to apprenticeship because these typically regard learning as a dyad between the apprentice and the master or mentor/mentee (Wenger 1998). Instead, this approach sought to characterise learning as a transformation of ability to participate in tasks and a change of identity of the individual as they become socialised within a community of practice.

The concept of LPP is similar to Rogoff’s (1990) description of guided participation. She described this as the process where children learn to develop their thinking skills through guidance from more able peers and caregivers while completing culturally valued activities. Although similar in her use of degree of participation as a measure of attainment, Rogoff’s (1990) focus emphasised the development of thinking skills through a process of socialisation. However, for Lave and Wenger (1991), the goal was the change in the individual’s identity that occurred through increasing participation in core community practices. Rogoff’s (1990) concept of guided participation also drew on Vygotsky’s (1920-34) concept of the zone of proximal development as a framework but went further by emphasising that children have a greater and more active role in learning. Rogoff (1990) also recognised that the guidance provided through communication with more skilled partners is not always overt and formal, and consequently may also involve tacit forms of communication.

One of the key challenges for social learning theory is demonstrating that socialisation is the core learning process, rather than a secondary process (Salomon & Perkins, 1998). However, as these researchers point out, this dilemma is no greater than constructivist researchers having to deduce internalised learning processes from participant responses to experiments that they have devised.

1.2.3 Contributions of Theories of Learning

At the beginning of the chapter, the development of professional artistry was introduced as the level of clinical skills to which clinicians wanting to excel in their professional field should aspire. Whilst this level is not a realistic goal for entry level practitioners, it was argued that the types of experiences students receive as undergraduates are likely to shape their future development of professional artistry. The development of professional artistry can therefore be seen as a journey along a continuum which begins early in professional education. Practitioners who have developed professional artistry are informed by theory when selecting best practice. At a basic level, the fundamental elements of theoretical knowledge must be presented, made sense of, and incorporated into the individual’s existing knowledge and
experience. Theories of learning emphasising the constructivist approaches within the individual provide important contributions to the understanding of how students acquire the necessary theoretical knowledge to become practitioners. These theories highlight the need for individuals to be actively engaged in the learning process. They also indicate the importance of presenting challenging information or problems which encourage students to reflect on and question their current knowledge base and assumptions. Finally, they recognise that each student or clinician will integrate new knowledge depending on their individual interpretation and assimilation of the presenting information in the light of their own prior knowledge and past personal experiences.

Professional artistry requires more of the clinician than simply the ability to learn theoretical information. Clinicians must also competently and actively apply professional artistry to presenting clinical situations. The application of knowledge to new presenting situations often requires some degree of transformation even when there is a high degree of similarity between cases. The degree to which transfer may successfully occur is an issue of contention between constructivist and sociocultural approaches. Constructivists suggest that individuals have the potential to transfer information and proponents of sociocultural approaches believe that there is limited opportunity for transfer, as knowledge is considered highly context dependent. Both theoretical perspectives indicate that assumptions regarding the degree of transferability of skills is of critical importance to educators, especially in relation to curriculum development. This issue will be explored in greater depth in Chapter 2, however, at this stage it is important to acknowledge that the controversy these theories create is an important contribution to ensure that the issue of transfer remains at the forefront of discussions of learning and curriculum design.

Theories of learning that emphasise socialisation provide some insight into how participation in core activities within specific communities may foster the application of acquired knowledge to clinical practice and the development of a professional identity. Such theories have an important role in enhancing our understanding of the development of professional artistry by emphasising the importance of engagement in clinical practice as an authentic, holistic learning experience. However, whilst exposure to clinical cases can assist with improving competency and participation in the community, the development of professional artistry requires a more specific description of the refinement and integration of clinical skills than can be adequately captured by measures of participation. Adding to the complexity, many of the skills that competent clinicians apply to practice are highly tacit in nature. Just participating in clinical practice may not make these skills adequately salient, especially for students and entry level practitioners. Recently there has been a push to bring to
consciousness some of the automatic skills that competent clinicians apply in clinical practice. By discovering these elements of practice, educators may be able to use this knowledge to explicitly teach clinical skills or develop frameworks that describe the development of these skills. In the next sections, studies of expertise and professional practice will be examined to explore how they may contribute towards a better understanding of the development of professional artistry by revealing these skills.

1.3 Theories of Expertise

The study of expertise is a relatively new development which can be traced back to the mid-1960s (Glaser & Chi, 1988). Early research was sparked by the poor efficiency of processing methods in artificial intelligence when compared with experts in fields (Perkins & Salomon, 1989). For example complex systems of analysis and decision making could be programmed into computers to allow them to analyse the next best chess move, however, expert chess players could complete the same task seemingly effortlessly without needing to employ the same level of cognitive analysis or time. It became clear that these masters were not responding to set moves by opponents one move at a time, rather they had a wealth of specific knowledge about chess and they were able to recognise numerous patterns and plan sequences of moves in chunks which took into account multiple moves with multiple pieces (Perkins & Salomon, 1989). These findings suggested that being an expert required the use of some very specific domain knowledge. Understanding the nature of this specific domain knowledge became the focus of research in the 1970s and 1980s. This research focused on describing differences between novices and experts (Ericsson & Smith, 1991). These theories of expertise continued to have strong parallels with theories of learning that emphasised information processing approaches and artificial intelligence. Alexander (2003a) reported than in early studies of expertise it was thought that by determining the characteristics and actions of experts, it would be possible to train novices or build smart machines to develop expertise.

There have been studies and reviews of expertise across a broad range of domains including typing, chess, memorising restaurant orders, mental calculations, programming; and solving ill-defined problems such as responding to variations on the stockmarket and making judicial decisions and medical diagnoses (Chi, Glaser, & Farr, 1988). From this research, several attributes of experts across domains were revealed. Experts were considered to be highly motivated and have extensive procedural and declarative knowledge which enables independent practice, with many skills considered to be automatic (Walker, 2001). Lajoie (2003) and Glaser and Chi (1988) identify a range of other traits including the domain specific nature of their expertise, exceptional memory for information within their domain, better pattern recognition, deeper level problem solving, faster, more accurate problem solving, and greater insight into
their knowledge base and gaps within it. The difficulty for educators is that, whilst these studies provide insight into the characteristics of experts when compared to novices, they do not identify how novices develop their skills through the transition from novice to competent practitioner and expert.

1.3.1 Models of Expertise in the Classroom

Alexander (2003b) reported on the difficulty of applying such traditional models of expertise to educational practice, particularly when examining the development of proficiency within the school setting where students are not expected to develop an expert level of performance throughout their study. Similar dilemmas emerge for new graduate clinicians who will be expected to show entry level competency rather than expert level proficiency on graduation. To combat this Alexander (2003b) proposed the Model of Domain Learning (MDL) as a way of describing the development of expertise within school-based academic domains. In contrast to other approaches to expertise the focus of the MDL was to improve student learning and development within school domains.

An important contribution of Alexander (2003b) was to address the dichotomy of novice and expert present in many traditional theories of expertise. Instead of describing the novice and the expert, her model focuses on describing the journey towards expertise that occurs in academic subjects in schools. The model emphasises knowledge, strategic processing and interest and how these evolve over three stages of domain learning: acclimation, competence and proficiency. Knowledge is further subdivided into domain and topic knowledge. Domain knowledge refers to the breadth of a student’s knowledge, whilst topic knowledge examines the depth of knowledge related to a specific event. The MDL also distinguishes between the levels of processing that students use depending on their level of proficiency. Alexander (2003) describes surface level and deep level processing strategies. Surface level strategies such as pre-reading and paraphrasing help students to make sense of the text. Deep processing strategies require students to engage more closely with the text, to look critically at it and/or form mental representations arising from the content. Student interest is also seen as an important component of the model. Individual interest is the level of interest students bring to the learning environment and it can be general or professional. In addition to individual interest, situational interest is also an important aspect of the model and describes the ‘here and now’ interest in the immediate learning activity. All of the above components influence each other and the relationship between such components is proposed to influence learners differently depending on their stage of expertise development.
In the first stage of Alexander’s (2003) model, acclimation, students are unfamiliar with the content of the domain, making critical analysis of materials difficult. Surface level strategies are common, and due to the novel nature of the domain, learning is heavily reliant on situational interest to engage and motivate student learning. By the time students reach the competence stage they have acquired an adequate body of cohesive knowledge to be able to engage in both surface and deep structure learning processes. Personal interest rather than situational factors more frequently moderate engagement in learning. The progression from the competency stage to the proficiency/expertise stage is characterised by an achievement of overall competency with both a broad and deep knowledge base. In addition to this, experts make novel contributions to further the knowledge base in the domain. There is a high level of strategy use and learning occurs through deep structure learning processes. Interest levels are also high and regulated by the individual’s interest rather than situational factors. School children are not expected to reach the proficiency/expertise stage of the model, but they are expected to transition from the acclimation stage to the competence level.

The triarchic model is another framework that has recently been applied to guide the development of school-based expertise (Sternberg, 2003). This framework suggests that conventional teaching methods and curriculum place too much emphasis on memory and analytic based instruction and assessment. Sternberg (2003) suggests that such emphasis risks creating pseudo expert students because what they are learning does not adequately reflect the type of skills and thinking required to function well in the domain outside the school setting. Sternberg (2003, p. 5) suggests that the focus of schools needs to be on developing “successful intelligence” which enables students to function well in both school and real-life domains. Whilst he acknowledges the importance of memory and aptitude in learning he focuses on the development of three core types of thinking skills which characterise experts in a variety of domains: analytical thinking, creative thinking and practical thinking. He captures this by explaining that creative thinking allows the generation of ideas; analytical thinking allows the evaluation of these ideas; and practical thinking allows students to apply their ideas and persuade others that their ideas are valuable. He argues that this is a more holistic approach to expertise, with many other models emphasising only the role of practice in learning when both creativity and analytical skills are also critical. Similarly, knowing how experts organise their knowledge does not necessarily translate well into strategies for teaching novices.

1.3.2 Intelligence, Abilities and Expertise

Ackerman (2003) explores expertise from an intelligence perspective that examines skills more broadly than traditional schooling and intelligence testing. Traditional schooling and intelligence testing can neglect important aspects of intelligence essential for developing
domain-specific knowledge and expertise, and consequently intelligence testing can be a poor predictor of expertise (Ackerman, 2003). His approach examines expertise from a trait complex approach, looking at whether certain combinations of cognitive, affective and conative (motivational) traits enhance or hinder the development of expertise in specific domains. Cognitive refers to the individual’s cognitive ability, affective refers to personality traits and conative relates to an individual’s level of motivation and interests. Ackerman’s (2003) work follows the view that there are two types of intelligence: fluid intelligence and crystallised intelligence. Fluid intelligence is mostly physiologically based and emphasises memory skills and abstract reasoning skills which are typically targeted in traditional intelligence testing to reduce the impact of world experience on test performance. In contrast crystallised intelligence is highly influenced by social and cultural contexts including family, academic learning, hobbies and vocational settings. Ackerman (2003) developed a model to describe these traits called intelligence-as-Process, Personality, Interests, and intelligence-as-Knowledge (PPIK). This model attempts to capture both the traditional psychological methods of assessing fluid and crystallised intelligence and employ a pedagogical method to establish what individuals know through the use of domain knowledge assessments. Ackerman (2003) asserts that the pedagogical assessment is particularly important in the case of assessing adult knowledge as it provides a more accurate measure of what they can do from a day-to-day performance perspective. Performance on these measures may have predictive capabilities to match student aptitude with careers in specific domains or alternatively suggest areas of weakness that may require remediation. They may also allow closer matching of student learning styles and specific instructional techniques.

Sternberg (1988) also describes a developing model of expertise where he sees abilities as a form of expertise. with individual’s existing abilities providing them with the potential to develop expertise in a variety of domains. His model contains five key interrelated elements: metacognitive skills, learning skills, thinking skills, knowledge, motivation and context. Metacognitive skills refer to the individual’s understanding and control of their cognition and include important skills such as problem recognition, problem representation, strategy formation, resource allocation, monitoring and evaluation of problem solving. Learning skills are concerned with knowledge acquisition which can be both explicit and implicit, selecting relevant information (selective encoding), collating relevant information, and relating new information to previously acquired information. There are three types of thinking skills: critical analytical (analysing, critiquing, judging, evaluating, comparing, contrasting and assessing), creative (creating, discovering, inventing, imagining, supposing, hypothesising) and practical (applying, using, utilising, and practicing). Two types of knowledge in academic settings were also included: declarative (facts, concepts, principles, laws, knowing that) and
procedural knowledge (procedures and strategies – knowing how including procedural tacit knowledge). Motivation is also an important component of the model. Achievement focused individuals strive for better performance by seeking moderate risks involving tasks that are neither too hard nor too easy. Competence motivation (self-efficacy) is also an important component of the model as belief in an individual’s own abilities to solve problems assists with ensuring they continue to have the tenacity to problem solve even when faced with a challenging task. Finally, the context of performance will also impact on all of the above learner characteristics.

Novices move towards expertise by engaging in practice. The key factor driving this is the individual’s motivation. Without motivation there is no thinking or active attempts at learning. The model is cyclic and individuals move progressively through the model numerous times. Sternberg (1988) gives the example of an expert first year student in comparison to an expert in the field. By the time individuals reach a level of expertise they have developed the ability to become reflective practitioners. The context of learning may either foster or inhibit the development of expertise depending on the environment and opportunities for support.

1.3.3 Cognitive Task Analysis and Theories of Expertise

In a different approach to expertise, Lajoie (2003) suggests that theories of expertise can facilitate learner development by providing overt pathways to expertise for learners and also by informing methods of instructional design. She argues that, to be useful, models of expertise must do two things: highlight the domain specific characteristics of experts within the field; and provide a guide of how learners can progress towards this level of competency, an area that has not been adequately explored in the literature. She suggests that this pathway to expertise will not necessarily be linear however, if transition periods can be identified then these can be used to guide instruction and assessment.

When examining the qualitative and quantitative differences between novices and experts Lajoie (2003) used cognitive task analysis (CTA) as a methodology to map experts’ planning, strategic knowledge, actions and interpretation and compared and contrasted this with novices. From her research it became clear that there were multiple trajectories and ways of solving problems, however, the underlying mental models that experts were operating from appeared to be similar. For example, when working with a group of expert surgical nurses she observed that, although the nurses came to the same conclusions the actual routes of hypothesis generation, planning of medical intervention, actions, results, interpretation and solution paths were different. These varying paths to the solution were then used to help create a computer based learning environment for surgical nurses that included decision making trees to facilitate
self-monitoring and provide opportunities for nurses to compare their processes with experts at different stages of the clinical process.

1.3.4  **Collaboration, Problem-solving and Theories of Expertise**

Another essential aspect of expertise that is not well explored in traditional studies of expertise is the role of collaboration (Lajoie, 2003). In the case of medical research into the nature of expertise, most studies involve experts and novices being presented with written case studies and then using a cognitive approach to analyse data. Lajoie (2003) maintains that the difficulty with these approaches is that they do not have adequate parallels with real world medicine cases where the approach is often to collaborate with a range of professionals with a hierarchy and varying levels of expertise to jointly problem solve and develop appropriate courses of action. Research is required to understand the transition towards expertise when students and professionals with different levels of expertise interact together. She suggests that dynamic assessment provides a good method for evaluation in this area because it allows constant monitoring of the learner’s abilities and enables constant feedback to enhance the learner’s knowledge base. This constant loop of assessment and feedback more closely resembles the collaborative nature of knowledge building and problem solving that occurs simultaneously in real world collaboration.

Lajoie (2003) reports that there is currently considerable research utilising technology to examine ways to feasibly replicate a collaborative approach to problem solving such as creating intelligent feedback processes. This is achieved by examining competency clusters established by studying experts, and then measuring the overlap of student actions with these clusters. Dynamic assessment occurs by providing feedback in relation to student actions and aims to assist students to become more systematic and strategic in their reasoning. If successful, these approaches may alleviate some of the challenges of replicating collaborative approaches in the classroom.

In a similar manner using a situated cognition approach, Brown and colleagues (1989) examined how novices (students), experts and an additional group they called “just plain folks” (JPFs) learn tasks. JPFs are ordinary people who actively engage in learning through solving problems they encounter on a day-to-day basis during their lives. The authors contend that when exposed to new problems, the experts and JPFs typically employ similar reasoning strategies. JPFs use causal stories where they use knowledge gained from similar previous experiences or knowledge about these experiences to facilitate their reasoning about a current problem. Experts use causal models which also rely on reasoning which draws on experience gained from solving similar problems encountered previously. Both of these types of learning
occur in context and there are several similarities between the two approaches. In contrast the authors suggest that students or novices typically reason with laws or theories which are often presented outside the contexts in which they are authentically used. As an illustrative example, they consider how mathematics is typically presented as a series of exercises contained in a textbook. Such a presentation is removed from the context in which mathematics problems are presented and solved in real life contexts by both JPFs and mathematicians. In these cases both the tangible nature of the problem and the parameters are set by the presenting situation.

Lave (1988) had similar findings when she examined the performance of people when solving mathematical problems in everyday situations and in traditional arithmetic school-like testing. Shoppers were given the task of calculating the best buy from a group of groceries and working out food portion sizes in a group of weight watchers. She found that there was no correlation between traditional test performance and the performance on these everyday tasks with the latter usually having the greater success rate. These participants did not tend to use formal mathematical operations learnt at school to solve everyday problems. She attributed the differences in performance as an indicator of the situational specificity of knowledge.

1.3.5 Expertise Development in Health Professionals

There has also been recent interest in exploring the nature of the development of expertise in health professionals. Much of the previous interest has centred on the education of medical and nursing students and the nature of expertise development in these professions has been extensively studied. Benner (1984) developed the Dreyfus Model of Skill Acquisition to describe the development of expertise in nursing. This model consists of five stages: novice, advanced beginner, competent, proficient and expert. It tracks the development of three specific areas of skilled performance. The first involves shifting from a reliance on abstract knowledge to experiential knowledge gained from previous clinical experience. The second skill involves the clinician’s competency to deal with the complexities involved in the case. Initially inexperienced clinicians find situations demanding and see a presenting case as involving a combination of equally important parts. Over time as situations become less demanding they make the transition to see a presenting case in its entirety and have the capability to recognise the specific areas that need to be prioritised in each presenting case rather than employing a rigid set of procedures. The third area of skill development concerns the level of involvement that clinicians have with patients and their presenting situation. Beginning practitioners have a tendency to look at situations with a higher degree of detachment when they first begin working with clinical cases. Over time, as they become more able to focus holistically on a presenting case, they are less abstract and procedurally focused in their practice and become more actively
engaged in clinical practice as it relates to a specific client. Benner (1984) describes this transition as the move from detached observer to involved performer.

There have also been efforts to characterise the nature of expertise development in physiotherapy (Jensen, Gwyer, Hack, & Shepard, 1999). From their research in expertise they characterised the transition from student to novice (entry level practitioner) to competent clinician to expert practitioner as the progressive integration of the core clinical areas of philosophy, knowledge and clinical reasoning. For experts philosophy includes beliefs that patients should take responsibility for their own health; that morally clinicians needed to use their skills to their maximal ability to facilitate best outcomes for patients; and that clinicians need to work with compassion with their patients. They refrain from judging patients, are confident in what they know but are also aware and unafraid to acknowledge the limits of their knowledge and expertise. Experts are constantly evolving their knowledge base and are highly motivated to learn new skills. Their knowledge is highly integrated and includes areas such as basic sciences, movement disorders, their clinical area of specialty, and knowledge of patients in terms of physical impairment and functional limitations. Experts have greater knowledge of patients as people which also facilitated patient education. In addition they have a broad knowledge of the health systems they work in and of how to acquire resources within these systems (Jensen, Gwyer, Hack, & Shepard, 1999). The clinical reasoning of experts is characterised by a focus on patient specific outcomes. They typically have their own data collection method personalised from experience, and this framework enables them to retain extensive patient details and then recall and record them at the conclusion of the session (Jensen, Gwyer, Hack, & Shepard, 1999). Patients were actively involved in assessment, discussion and problem-solving and there was an ongoing cycle of assessment and treatment. Listening to the patient and observing were the main assessment tools used rather than instruments or other methods of data collection (Jensen, Gwyer, Hack, & Shepard, 1999). This concept of blending of skills with increasing competency is also discussed in reference to how practitioners develop their knowledge base to facilitate person centred care: “such expertise involves the blending of self-knowledge and intellectual, emotional and personal maturity with the person’s professional knowledge base” (Titchen, McGinley, & with McCormack, 2004, p. 108). Patient centred practice is also recognised as a sign of expertise in clinical practice in nursing. To do this effectively requires the clinician to be able to employ therapeutic use of the self in combination with professional craft knowledge. The ability to do so relies on a combination of intuition, rational thought and the ability to self-reflect whilst engaged in clinical practice (McCormack & Titchen, 2001).
1.3.6 Contributions of Theories of Expertise

Theories of expertise offer many insights to educators of health professionals on the facilitation of the development of professional artistry. Educators do not face the same degree of dilemma that schools face because ultimately students are being educated to become a member of a particular profession. However, the dilemmas faced by schools tend to be more pronounced in early years of health science degrees where the focus is on obtaining the basic foundation skills and knowledge and there is a much smaller applied practical component in the curriculum. Alexander’s (2003) description of the journey from acclimation to competence and then proficiency may provide a framework for understanding how students acquire knowledge in specific academic domains and how learning becomes deeper and knowledge more efficiently integrated. In contrast to school students, health science students must make the complete transition to proficiency if they are to successfully become practicing health professionals.

Similarly, Sternberg’s (2003, p. 5) notion of “successful intelligence” (comprised of analytical thinking, creative thinking and practical thinking) may be a useful framework to encourage lifelong learning, given that at graduation, new practitioners have acquired only an entry level of competency and will spend a considerable portion of their early years in practice extending, consolidating and integrating these foundation skills in their clinical practice. These successful intelligence skills are essential given the speed at which knowledge is evolving within health professions.

Approaches to expertise that seek to characterise differences between novices and experts are less useful to educators because it is unrealistic for students to make the transition from novice to expert in the course of their study. Even with considerable professional experience, not all clinicians will become or aspire to become expert clinicians (McAllister, 1997). Many of the characteristics of experts, such as greater integrated knowledge and superior pattern recognition can only be developed during professional practice because of the amount of clinical exposure it takes to develop clinical skills. They do, however, provide a way of characterising the types of advanced clinical skills that are characteristic of clinicians demonstrating a high level of professional artistry.

Theories of expertise draw much of their knowledge from an information processing approach. These approaches focus on expertise from a decision making perspective and consequently do not give adequate recognition to the role of enculturation in the development of expertise (Bromme & Tillema, 1995). Many studies of expertise have tried to compare commonalities between experts in a range of fields. However, examining the traits which appear domain specific and not common to all types of experts may be more revealing of the specific
characteristics that define competency and expertise within a given profession (Bromme & Tillema, 1995). For educators the challenge is to enable the transition from student to competent entry level practitioner. Such a transition requires an understanding of learning, the development of expertise and the development of practice knowledge which is explored in the following section.

1.4 Theories of Practice

Many theories of expertise emphasise experience. However, when approached from the perspective of professionalisation, the meaning of expertise becomes more about developing the specific knowledge base needed to become a professional in a given field (Higgs & Bithell, 2001). The mechanism for development in these areas is a process of professional socialisation. Even an experienced practitioner’s level of expertise is likely to fluctuate within their practice because the level of skill exhibited will also depend on the familiarity with the context and the amount of experience with the specific presenting clinical case.

Higgs and Hunt (1999) describe several models of professional education and how its historical evolution and application to clinical practice has unfolded. The apprenticeship model placed emphasis on practical knowledge and art of practice, but the quality of learning experiences within this model was highly dependent on the skills of the master. In the early twentieth century as health professions started to gain greater recognition of their domain specific knowledge the health professional model emerged. In this model, there was a shift in focus from clinical/technical competence to the scientific basis of knowledge. Professional practice during this period often used the medical model as the basis for best practice. The clinical problem solver model emerged in the mid to late twentieth century and was a reaction to the rate of knowledge expansion and the speed of technological advances. This approach emphasised problem solving, but at the same time it downplayed the importance of knowledge given the rapid rate it was changing. Proponents of this approach were eventually forced to reconsider its philosophy on knowledge in response to increasing recognition of the links between reasoning, problem solving and knowledge. Contemporary contributions include problem-based learning, and an acknowledgement of the domain specific nature of knowledge.

In the 1970s and 1980s the competent clinician model placed emphasis on competency, cost effectiveness and accountability (Higgs & Hunt, 1999). This approach tended to over value technical competencies that were readily observable and measured. The reflective practitioner model was then developed in an effort to address the perceived theory-practice divide. Experts were recognised to have more artistry, wisdom, talent and intuition than novices and this was apparent in their reflection and reflective practice. As a result of increased interest
in evidence based practice, the scientist practitioner model developed in the second half of the twentieth century (Higgs & Hunt, 1999). This model was concerned with the degree of rigor in evidence. However, this approach sometimes caused conflict by devaluing elements of practice that were not readily measured using the scientific basis of evidence.

1.4.1 Professional Practice and Clinical Education

Many of the models outlined above aimed to describe perceived best practice in practicing clinicians. They also influenced learning, curriculum development and clinical supervision of health professional students. Anderson (1988) described a continuum of clinical supervision which may relate well to the concept of legitimate peripheral participation and the role of socialisation in learning for both students and practicing clinicians. In the continuum there are three stages in supervision practices. In the early stage, the evaluation feedback stage, the supervisor takes a very active role using a direct style of supervision while the supervisee has a passive role in the process. As the supervisee’s skills and experience develop they move into the transitional stage of supervision. At this stage the supervision style moves to a more collaborative interaction with the supervisee increasing their level of active involvement in joint problem-solving. The supervisor’s role reduces as the supervisee’s competency and contributions to the process increase. At the end of this stage, when the supervisee is directing the majority of supervision, the supervisee moves to the self-supervision stage where the supervisee has the skills to take responsibility for their own lifelong learning. Supervisees are now expected to have reached a level of competency where they can engage in self-reflection about their own performance. The power balance between the supervisor and supervisee has also shifted so that the relationship is a more equal and collegial relationship. Support is in the form of consultancy at this stage. The level at which people function on the continuum is not linear as a factor of time. Supervisees may exist at different levels on the continuum depending on the circumstances (for example: an experienced clinician in a new job working with new client group may be at a lower level initially in this new context despite having many clinical skills). Similarly clinicians can start in the transitional stage rather than the evaluation stage depending on past experience.

Another approach that has been applied to the development of practice through clinical education is the learning vector model (Beck, Youngblood, & Stritter, 1988). In this model, students transition through three stages during their professional development: exposure, acquisition and integration. In the exposure stage the novice student mostly observes and is then asked questions by the instructor. Feedback consists of an evaluation of the answers given by the student. In the acquisition stage the student takes a more active role their own learning through greater involvement in planning, implementing and evaluating parts of learning...
activities. Students independently complete components of the task under guidance from the supervisor and then evaluate their performance. The supervisor provides feedback about each component of participation in the learning activities. In the integration phase, students take a more independent approach to planning, intervention and evaluation of the tasks, with supervisors modifying approaches when required. Students evaluate their own performance and seek evaluation from a broader range of sources including other students, practitioners and supervisors. Evaluation of the student centres not just around their task performance and self-evaluation, but also their ability to seek and integrate feedback from a range of sources.

Whilst these models provide good guidance to educators, the transformation from student to practitioner remains problematic. An examination of current research in professional practice provides insights into the types of knowledge and skills which are valued attributes in skilled clinicians. By examining these skills it may be possible to identify important skills and pathways to foster their development in students and clinicians.

### 1.4.2 Becoming a Professional

The transition from occupation to profession has its roots in a process of socialisation. Contemporary views of practice are challenging traditional views that perceive practice as the application of theory in a technical way. In the contemporary view, practice is recognised as a highly complex and unpredictable environment in which the development of professional artistry is essential (Higgs, Andresen, & Fish, 2004). Students need to develop the capacity to evolve their practice in a changing health care environment that has increasing emphasis on the provision of patient centred care (Sefton, 2001). This process involves not only what students know and can do but also what they become as they develop their identity as a health professional through a process of socialisation (Dall'Alba, 2009). She suggests that the identity students commit to developing influences the knowledge they seek, how they act and their perception of who they are:

> When aspiring professionals seek to enter a profession, the practices they learn to embody have their own routines, histories and traditions. Learning to engage with these to the extent they are manifest in the present and relevant for the future is a necessary part of learning professional ways of being. Transformation of the self in becoming a professional is, then, not a wholly individual or isolated enterprise. (Dall'Alba, 2009, p. 37)

Higgs and colleagues (2004) examine the complex relationship between knowledge and practice. Their model takes the view that practice has primacy and that it is practice that ultimately informs theory. In their model they represent the elements of practice as activities
and experiences such as exploration, experience and artistry. Knowledge is represented by two interconnected loops that represent practice knowledge and reasoning, both of which are developed through participation in practice.

Learning to become a professional requires students to learn cognitively, but equally critical is the cultural learning that occurs through social learning (Abrandt Dahlgren, Richardson, & Sjöström, 2004). Students need to develop cultural understanding of their own profession and the influence of multiple cultures within the institutions and different professional groups. Different groups of professionals develop their own specific language, way of communicating, observing and thinking (Higgs, Andresen, & Fish, 2004). Students also need to develop the ability to work with clients with different cultural backgrounds. Developing an understanding and appreciation of how differing beliefs, attitudes and values influence approaches to health care is essential to developing cultural competency in students (Twible & Henley, 2001).

Cusick (2001) describes the process of becoming a professional as a conscious process, involving both role taking and role making, that allows an individual to develop their own professional identity. Learning takes place through socialisation as the individual learns the specific skills and knowledge associated with their profession. The attainment of skill can be benchmarked by measures such as the degree to which they are able to independently complete tasks. As students and professionals change in their level of competency, the roles they make for themselves and play within an organisation adapt accordingly. Three particular aspects of the individual are proposed to have an important influence on how the attributes of an individual impact on professional practice: the world views of a person; professional development; and personal morality in professional behaviour. A person’s world views consist of their “deeply held beliefs about reality and the nature of the self and other human beings” (Cusick, 2001, p. 92). Such beliefs are influenced by culture, history and personal life experience. Developing an awareness of these world views is important as they can have significant but often unrecognised impacts on clinical practice. Similarly in the case of undertaking professional practice, the self is not separate from the clinician as they further their expertise through professional development. The type of knowledge that is valued and motivating to the learner will be influenced by both personal interests and the motivations of the individual clinician. The professional development gained by the clinician will in turn influence the ways in which personal values are manifested in clinical practice. A third way in which the person may influence practice is through the way personal morality influences professional behaviour. Professional norms should influence practice judgement and provide some separation from the individual’s moral judgement. However, the separation of the two is artificial and hence
professional judgement and practice does have the potential to be influenced by personal morals concerning right and wrong (Cusick, 2001). There is a need for individuals to settle any incongruence between their own personal morals and professional practice in accordance with professional standards and codes of conduct.

1.4.3 Knowledge

There is recognition of the importance of understanding practice knowledge and how it develops, but there are very few guidelines or frameworks which can assist clinicians and educators in this endeavour (Titchen & Ersser, 2001). The current dominance and value placed on theoretical knowledge that is deductively based rather than interpretive or explanatory in nature currently limits the way in which practice-based theory and knowledge is explored and valued (Titchen & Higgs, 2001). Practice knowledge can be created and acquired through both ontological and epistemological methods that require personal reflection and socialisation to develop professional knowledge (Richardson, Abran odbyt Dahlgren, & Higgs, 2004). Titchen and Higgs (2001) give the analogy of professional knowledge being like an iceberg where only a small proportion of practice knowledge is readily expressed by the practitioner. They report that often novices have to ask more experienced clinicians ‘stupid’ questions because what they seek to understand is so automatic and taken for granted by more experienced clinicians that it is rarely consciously articulated.

Professional knowledge can be viewed from the perspective of the health profession, or from the perspective of the individual practitioner whose knowledge within the context of the health profession is continually evolving (Titchen & Higgs, 2001). To facilitate the development and understanding of professional craft knowledge, Titchen and Ersser (2001) highlight the need to develop strategies which enable professional craft knowledge to be clearly articulated, such as describing and recording aspects of expertise present in everyday practice. In order to broaden professional craft knowledge and also evaluate the appropriateness of such knowledge within the practice of a specific community, there is a need to ensure that this articulated knowledge is shared with other professionals so it may be critiqued and validated by the community as well as the individual. This process creates new knowledge within the community as practitioners have the opportunity to add new ideas to their own clinical knowledge, and also explore ways that such expertise could potentially be applied to other situations with similar clients (Titchen & Ersser, 2001). Professional knowledge is situated in the practice context (Richardson, Higgs, & Abran odbyt Dahlgren, 2004). Richardson and colleagues (2004) suggest that recent moves away from a medical model of healthcare focused on curing disease to a more holistic and individualised model of healthcare places increased demands on practitioners because of the less predictable nature of practice. There is a greater
emphasis on the education and empowerment of patients, allowing them to take an active role in determining goals that will enable them to lead healthy lifestyles.

*Practice knowledge* includes the knowledge, beliefs and values practitioners have about what they do, how they do it and why they do it (Richardson, Higgs, & Abradnt Dahlgren, 2004). When examining professional practice they report that there can be tensions between knowledge forms that are concrete, objective and generalised and knowledge that is interpretive, subjective and contextual. These tensions are very apparent in the current context of evidence based practice. There are a range of types of knowledge that are useful to describe the knowledge necessary to be a successful clinical practitioner. Terms used to describe these types of knowledge include practical knowledge, knowing in practice, experiential knowledge, aesthetic knowledge, intuitive knowledge, ethical/moral knowledge, embodied knowledge, personal knowledge, propositional/empirical knowledge and scientific knowledge (Titchen & Ersser, 2001). *Practical knowledge* is described as knowing how to perform a task, whilst *knowing in practice* encompasses both practical knowledge and theoretical knowledge which is transformed through contextualising this knowledge in professional practice. *Experiential knowledge* typically involves a growth in knowledge from encountering a situation. *Aesthetic knowledge* concerns professional artistry – the form and style of professional practice. *Intuitive knowledge* involves practitioners’ gut feelings and *ethical knowledge* describes practitioners’ understanding of morally and what needs to occur in patient care. *Embodied knowledge* involves using the body rather than the mind to interpret information. *Personal knowledge* involves developing self-awareness of the impact of the practitioner as an individual on patient care. Titchen and Ersser (2001) suggest that this broad range of terminology has hindered research by making it difficult to compare different sources of research. They propose that the term *professional craft knowledge* that incorporates both the knowledge base and the ‘practical know-how’ needed to become a clinician may allow a more specific comparison. Professional knowledge includes the propositional and professional craft knowledge that is owned by the profession (Higgs & Andresen, 2001). It includes the history of knowledge and how knowledge has been applied within the profession at different times. Individuals then add to this their own personal knowledge from their experience within the profession.

Conroy (2001) describes professional craft knowledge as the ‘practical know-how’ needed to be a practitioner. He describes how this knowledge can be gained from several sources including the explicit curricula taught at university and implicitly (and sometimes unintentionally) through the values and assumptions and role models students are exposed to in class and during clinical placements. Professional craft knowledge covers a range of complementary domains such as scientific knowledge (a more traditional measurement,
processes and procedures-based, discipline specific knowledge domain which frequently follows the medical model) and the holistic domain which looks at the client as a whole person with consideration given to the client’s intellectual, emotional, physical, spiritual and social need (Conroy, 2001).

Knowledge has also been described using a dichotomy of propositional and non-propositional knowledge. *Propositional knowledge* or ‘knowing that’ usually occurs after the event and is commonly a result of observation and deduction based on those observations (Higgs & Andresen, 2001). In clinical practice it is the knowledge generated from theory and research. In contrast, *non-propositional knowledge* or ‘knowing how’ is the result of direct experiential participation in events and is much more individual in nature (Parry, 2001). Some elements of non-propositional knowledge are referred to as tacit knowledge as it is the type of knowledge that is often very difficult to overtly articulate because it can be a largely unconscious process. Examples of tacit knowledge include tricks of the trade, rules of thumb and making educated guesses when faced with gaps in knowledge (Parry, 2001). As previously discussed, the largely unconscious nature of this knowledge is problematic for both research and also making the thought processes and clinical reasoning behind courses of action salient to students and less experienced professionals (Titchen & Ersser, 2001). One possible approach to making these processes more explicit is to use an action science ‘theories in use’ approach that aims to infer the theories being used by clinicians by studying their actions and reflections on actions (Parry, 2001; Schön, 1983). Such research can also assist in reducing theory and practice gaps by looking at how practitioners apply their theory to practice (Parry, 2001).

The development of professional craft knowledge is essential for the development of ethical judgment and decision making (White, 2001). She highlights that practice is so situated that clinicians must use their experiential knowledge to get the best outcomes for each patient. Part of that knowledge involves understanding the broader institutional systems and developing knowledge around how to access resources (both people and information), considering the priorities for both the client and the institution, and knowledge and empathy for the client’s own life story. The knowledge and empathy the individual learner or practitioner brings to situations through their life experiences is a vital but often under recognised source of knowledge. This type of knowledge is referred to as personal experiential knowledge (Beeston & Higgs, 2001). Growth of personal knowledge is equally essential because it underpins values and beliefs which can modify both clinical actions and methods of engagement (Beeston & Higgs, 2001). Fitzgerald (2001) highlights the importance of understanding that students bring their own cultural identities shaped by their own beliefs, ways of doing things, values and world view. She suggests that students and professionals often do not recognise that all people (clients and
colleagues), even if they do not belong to an overtly different cultural group, bring with them their own professional and personal cultural identities. Ultimately it is the blend of all of these types of knowledge that enables students to make the transition to practitioner.

1.4.4 Reflection

The role of reflection in professional practice has been gaining growing recognition since Schön’s (1983) work on reflection in the 1980s (Abrandt Dahlgren, Richardson, & Kalman, 2004). His work grew out of reaction to the historical integration of professional courses into university environments. This integration resulted in the adoption of the research practice of universities as a methodology for exploring professional practice. Schön (1983) coined the term technical rationality to describe this scientific approach to professional practice and argued that it could not fully account for how professionals think when they are engaged in professional practice (Abrandt Dahlgren, Richardson, & Kalman, 2004). Technical rationality involves the application of theoretical rules to problems. However, Schön (1983) argued that this type of problem solving where practitioners apply the best fitting theory to practice is not a reality in real life practice due to the ill-defined nature of clinical problems. Problems are intimately related to the situation that they present in and it is an important skill of the practitioner to discover and characterise the nature of the problem. Whilst underlying knowledge of theory is important to guide practice, there is an argument that this takes secondary importance to discovering and defining the presenting problem. Schön (1983) developed two important concepts in describing the reflective practices of practitioners: reflection in action; and reflection on action. Reflection in action occurs when something unexpected happens which makes practitioners think about what they are doing whilst the event is still occurring. In an attempt to address the unexpected occurrence, the practitioner must re-evaluate the problem from a new perspective and attempt to formulate a new solution that results in more positive patient outcomes. Reflection on action is a more retrospective approach to reflection. It often consists of the practitioner explaining actions and the decision making processes behind them and is considered to be an important aspect of clinical decision making. This type of reflection can also involve reflection on previous attempts at reflection in action. Reflection whether it is occurring as a ‘reflection in action’ or ‘reflection on action’ process is highly contextually bound both at a broad social, political and cultural level but also by the contextual forces at play within the smaller learning community in which reflection is occurring (Boud & Walker, 1998). Context is seen to legitimise reflection and is equally important even when the type of reflection is considered to be focused on an individual (Boud & Walker, 1998). Schön’s (1983) work on the role of clinical reflection has made two major contributions to the understanding of how clinical reflection develops (Abrandt Dahlgren, Richardson, &
Kalman, 2004). Firstly, it highlights the importance of context in practice. Secondly, it highlights the importance of the individual practitioner in integrating their own knowledge base through direct involvement in and reflection on clinical practice.

Beeston and Higgs (2001) describe professionals as practitioner-researchers who problem-set as well as problem-solve. Both processes require considerable reflection. Reflection is a process that may facilitate the development of professional skills in practitioners through both individual and group supervision (Amies & Weir, 2001). Dewing and Woodrow (2001) explore how clinical supervision can structure guided reflection on practice to develop professional expertise. They suggest that the structuring of reflection is important because when individuals reflect on their own there is a tendency to separate thought from action. By guiding the process through supervision they propose that professionals can gain a greater understanding of their practice when they are engaged with supervisors who can facilitate these discussions through focused support and challenge. Amies and Weir (2001) examine the role of reflection in the supervisory process using the context of a group setting. They use a five step process which involves a colleague presenting a practical example focusing on the clinician’s practice rather than the client’s case history and the presenter’s goals for the situation. Reflective questioning and then group discussion follows this presentation and then presenter’s feedback and a summing up section. Such processes are valuable in the group setting because they focus the group on making often tacit knowledge explicit (Higgs, Fish, & Rothwell, 2004). Such techniques may have value in clinical education, particularly if students have the opportunity to be exposed to the views and skills of more experienced clinicians. Reflection on practice is a way of making tacit knowledge explicit to other practitioners and students. Critical reflection requires practitioners to look at situations from perspectives other than how they may initially appear. This process often creates new insights and knowledge which can facilitate transformational learning to future clinical scenarios (Gamble, Chan, & Davey, 2001).

Similar to the above group activities another advocated method of professional learning is through the use of narrative (Fitzgerald, 2001). Narratives are an effective learning tool because they contextualise learning and assist both the story teller and the listeners to learn and recall information. Stories about critical incidents can help with the development of professional skills by socialising students into the professional norms and expectations in clinical practice. Critical incidents are seen as particularly useful teaching tools because there is often no clear cut solution and several possible approaches to management. Weighing up the relative merits of different approaches fosters students and other practitioners to be very reflective in their thinking and develop problem solving skills (Fitzgerald, 2001). Professional craft knowledge can also be developed in groups through the use of action research (Smith,
2001). In this research the focus is on practitioners modifying their practice by engaging in research and learning and can be completed at an individual or collaborative level with colleagues. The idea behind this research is that change is more likely to occur when practitioners actively invest in the process rather than have changes to practice imposed upon them. Action research is cyclic with clinicians continually searching for and researching best practice. The focus initially is on identifying an area of practice that practitioners would like to change. In the initial planning stage the focus is on setting the scene by identifying current practice in the area. This investigation then leads the narrowing of the topic focus area. The type of research and method of data collection are determined, and the research is undertaken. The evidence is then reviewed in relation to the outcome. If the outcome was met, new goals may be set at this stage. If not, modifications to outcomes, data collection or practice are made and the research is repeated. The final stage is the re-planning stage where the results of the previous research are built on to plan for the next cycle of research where the whole process is repeated (Smith, 2001). Smith (2001) emphasises that completing these tasks collaboratively has the greatest potential to enhance learning through peer interaction. He also suggests that the concept of a critical friend can greatly enhance the efficacy of the process by providing a person who has an established trusting relationship with the professional but still enough distance to effectively act as a critic by questioning and challenging inconsistencies in beliefs and clinical practice. He also argues that sometimes the best critical friends are not inside the specific profession because those inside the profession are likely to be educated and socialised into the same concepts of best practice, beliefs and values. Smith (2001) suggests that it is actually much more beneficial to have a critical friend who does not share the same assumed knowledge base because the inevitable naive questions that arise from a mismatch in knowledge bases are often good at challenging and forcing practitioners to explain the underlying knowledge and belief systems behind their practice. Opportunities for reflection both during and after engaging in professional practice are also essential. Titchen (2001) also discussed how to facilitate being patient-centred; to develop, apply and critique professional craft knowledge; and to be self-reflective/evaluative through the use of critical companionship. In critical companionship, less experienced practitioners are supported through interactions with more experienced practitioners. The basis of the technique is very similar to the skilled companionship model. It aims to facilitate patient-centred care in terms of the core concepts of mutuality, reciprocity, understanding the unique needs of the practitioner and graceful care. Through interaction with less experienced practitioners, critical companions make their own professional craft knowledge more accessible through several techniques including storytelling, making suggestions, assisting less experienced practitioners to analyse, interpret and evaluate experiences, and offering non-specific maxims. Observing, listening and questioning professional practice and providing feedback on performance are also essential components of the critical companionship role. By
extending original concepts of critical companionship, Titchen, McGinley and McCormack (2004) see critical companionship as a way of facilitating the blending of propositional knowledge, professional craft knowledge and personal knowledge by assisting the practitioner to overtly recognise the type of knowledge they are using, critically reflect on the type of knowledge that they use in practice and articulate the rationale behind the use of such knowledge in relation to a specific case. The ability to adapt the types and amounts of each form of knowledge to a given situation allows for the provision of a personalised patient centred approach to care. The mechanism used to adapt these varying levels of knowledge on a case by case basis is suggested to be governed by the professional artistry of the practitioner (Titchen, McGinley, & with McCormack, 2004).

The apprenticeship model is also advocated as a means of understanding the social nature of becoming a health professional (Best & Edwards, 2001). This model works well when combined with an adapted version of the critical companionship models. These models are seen as complementary by highlighting the socialisation processes which help students become health professionals. By combining this with the critical companionship model there is the opportunity to highlight the importance of guidance that students receive on placement through the use of role modelling.

1.4.5 Professional Practice and Artistry

There is growing support for a viewpoint that recognises the ‘primacy of practice’ rather than the ‘primacy of theory’ as the context in which professional knowledge grows both within the individual and the community. Such a shift in emphasis highlights the importance of developing professional artistry especially given the unpredictable and continually changing nature of professional practice (Higgs, Andresen, & Fish, 2004). Professional practice can be thought of as an individual activity by a practitioner or as an holistic concept encompassing both the practitioner and the history and traditions of the profession (Beeston & Higgs, 2001). Rather than taking the traditonal view of professional practice as the application of technical knowledge using specified methodologies, they suggest that professional practice needs to be seen as artistry where professionals take a dynamic approach which enables them to apply often incomplete knowledge to a variety of complex situations using their professional wisdom. This often requires a collaborative approach to practice involving a range of professionals.

In discussing professional practice as artistry there is still an acknowledgement of need for technical competence (Beeston & Higgs, 2001). However, in this view technical skills are seen as the foundation skills with artistry allowing the selective application of techniques based on the tacit beliefs, values, feelings and knowledge that guide practice within each
specific clinical case. Consequently, they suggest there is now greater recognition and acceptance in the professional world of multiple pathways and often creative solutions to specific clinical problems which are moderated by the specific clinical context. This diversity and the individual nature of how professional practice evolves makes it a difficult area to quantify and thus explicitly teach. These challenges are also present in the broader world beyond an educational context particularly with society valuing evidence based practice approaches (Beeston & Higgs, 2001). They suggest rigor in relation to professional artistry must be seen as socially mediated through exposure and criticism within the specific community of practice. Practice, whilst often creative and individually tailored to meet the specific context, must also be seen as credible and transferrable within the community. By sanctioning the practice of individual practitioners, the community builds and broadens the knowledge base of both the individual and the community of practice. Learning is therefore a lifelong process for both the individual and the community of practice.

1.5 Implications for Educators

The complexity of developing professional artistry requires educators to draw on multiple theories of learning, expertise and professional practice to gain an holistic understanding of the multifaceted nature of professional artistry. Theories of learning emphasising the individual do not provide adequate recognition of the important role of socialisation in clinical learning and developing a professional identity. Conversely theories of social learning, whilst recognising the important role of the community in shaping practice and identity, do not give adequate attention to individual attributes such as prior knowledge, motivation, intelligence, insight and self-reflection. Theories of expertise describe the attributes of experts and novices but frequently do not provide sufficient explanation of how novices become competent practitioners and then experts. Discussion of the knowledge, reflective skills and professional artistry highlights the impact of both the individual and the community of practice in the learning process. Such development must include a scientific knowledge base, a technical knowledge base, clinical experience, development of pattern recognition and problem-solving, ethical and moral development and growth in professional identity and clinical reflection skills. Professional artistry requires the integration of these skills. To provide the foundation skills for the development of professional educational practice therefore requires an integrated framework which can draw on these varied sources of knowledge and learning.

Adult learners draw on life experiences and tend to be more self-directed than younger learners. The ‘hands on’ real life aspect of actual clinical care helps facilitate deeper learning because it is highly meaningful and motivating for students and clinicians. Clinical placement encourages deeper learning by increasing the level of engagement of students and
encouraging a person centred approach to practice rather than a shallow self-centred approach to learning aimed at strategically learning the minimum knowledge required to meet specific course outcomes (McAllister, 1997). However, the acquisition of theoretical knowledge obtained in classrooms and tutorials is equally important as professional artistry requires the ability to integrate theory and practice and tailor the application to the individual needs of clients. The challenge is to successfully integrate theory and practice in a manner that fosters and mirrors the degree of integration that must be achieved to allow successful clinical practice.

Clinical reasoning has been described as the bridge between practice and knowledge (Higgs, Jones, Edwards, & Beeston, 2004). This reasoning is the process through which knowledge is put into use in practice. It involves the processes which enable clinicians to make decisions. In recent times clinical reasoning has come to be recognised not as a process directed solely by the clinician but as an interactive process between both the clinician and the client (Higgs, Jones, Edwards, & Beeston, 2004).

Models have been applied to clinical education in an attempt to facilitate the clinical supervision process and provide guidance to clinical educators on the best ways to maximise student clinical learning. Integrative models attempt to provide greater continuity between academic subjects and clinical practice by encouraging joint projects which overlap both areas of expertise such as seminars and conferences so that there is greater communication and interaction between clinical and academic staff (McLeod, Romanini, & Cohn, 1997). A similar integrative approach has been applied to teacher education where learning and problem solving is based on the student’s real-life difficulties whilst completing practicum placements. This approach emphasises the development of reflective skills, interaction with peers and an enquiry based approach to learning using real-life problems (Korthagen & Kessels, 1999). The authors suggest that when too much emphasis is placed on whether education should begin with theory or practice, the important question of how to introduce both in a way that facilitates integration can get lost. This same dilemma is faced within the health professions.

It has already been argued that practitioners need to draw on the contributions of multiple theories of learning, expertise and clinical practice to provide a framework that can adequately describe the complex learning processes involved in developing professional artistry. The difficulty is that some of the underlying assumptions of these theories have very polarised views especially in the case of the contribution of the individual and the community to learning. Despite these apparent differences in learning philosophies, it is clear from research into expertise and professional practice that learning is moderated by both the individual and the community of practice. Therefore efforts must be made to understand how two seemingly incompatible approaches can provide a complementary framework for learning. The following
section discusses the key conflicts between these theories and potential ways in which these approaches may be compatible. This discussion then forms the basis for the development of an integrated education framework in Chapter 2 which aims to describe and guide educators in the learning processes which enable the development of professional artistry.

1.6 Reconciling the Approaches

Any significant problem involves conditions that for the moment contradict each other. Solution comes only by getting away from the meaning of terms that is already fixed upon and coming to see the conditions from another point of view, and hence in a fresh light. (Dewey, 1902, pp. 3-4)

Hager (2005) describes several assumptions of learning that create much of the tension between current theories of learning. He suggests that although there is recognition that there are multiple ways of learning, learning through propositions is still considered the superior type of learning. He goes further to suggest that with this assumption come a number of other assumptions: that the best way to study learning is scientifically; that learning is primarily an individual activity; learning that is not transparent is inferior; and that learning is stable, enduring, and replicable. Many of these claims do not hold true for the types of learning processes involved in the development and evolution of professional artistry. Much of Hager’s (2005) article is devoted to shedding light on the historical basis of these assumptions and refuting these claims with reference to contemporary understanding of learning. These assumptions account for much of the polarisation present in current learning literature.

The current conflict surrounding theories of learning occurs because each approach to learning puts forward its own theory of learning as the sole mechanism through which learning occurs. This veil of mutual exclusivity creates a dilemma because theories that emphasise the individual and construction and internalisation of knowledge are in complete opposition to social theories of learning which emphasise the community and socialisation. When viewed in their current state there is very little possibility of these theories becoming compatible. Despite several attempts there has never been a generally accepted theory of learning that can account for a variety of different types of learning (Hager, 2005).

Rogers (2002) suggests that some of the difficulty of reconciling different theories of learning also relates to their specific focus on learning. For example, some theories explore why we learn and are concerned with motivational aspects of learning. In contrast, other theories of learning are more process driven and strive to explain how individuals learn. Furthermore, he suggests there is increasing recognition of the multifaceted nature of learning with the learner,
the learning context and the learning task all impacting on learning. Most theories do not account for all of these factors impacting on learning. Rogers (2002, p87) describes several types of learning including:

- Memorised knowledge – “I know”
- New understanding resulting in reconceptualisation – “I see”
- New skills – physical and thinking “I can”
- Changing attitudes “I feel/believe”
- Applying learning – changing ways of behaving “I do”

However, the difficulty for educators is that the development of professional artistry requires the incorporation of all of these aspects of learning including contradictory approaches such as constructivist and approaches emphasising socialisation (Higgs & Titchen, 1995). As Dewey (1902) suggests in the quote that commenced this section, little will be resolved unless the current theoretical positions are re-examined in a new light. Research in the development of professional artistry challenges the notion of a single dominant learning process involving the individual or the community of practice. The question then becomes not which theory correctly describes learning, but how theories coexist to support learning in the individual and the community. In answering this question, there are two potential research pathways which could be followed. The first approach is to take the view that ultimately only one theory should account for learning. To move forward with this approach a hybrid model of learning which combines key elements of both theories would be the solution. In essence such an approach could be seen as a compromise between the two extremes which allows elements from both theories to be incorporated into a new integrated theory. The difficulty of contemplating such an approach with such considerable philosophical differences in the role of the individual and the community and the potential for transfer across contexts, is that it may be impossible to find adequate common ground between the approaches to combine them. Alternatively, if adequate common ground could be found, the degree of compromise required to combine them removes the potency and unique contributions of both theories, resulting in a theoretically weak position which does not adequately account for learning in either the individual or the community. A much more promising approach is to take a larger step back and recognise that it may not be the difference in theoretical approaches that is the problem, but rather the preoccupation of seeing one theoretical approach as the explanation of learning. If a more eclectic view of learning is taken which recognises the value and importance of the individual and the community, these theories can be seen as complementary and coexisting rather than mutually exclusive views of learning. This thesis proposes a view of learning that recognises these learning processes as parallel. Both occur simultaneously, however, the relative dominance of a particular learning process at a given time will be determined by the nature and context of the specific learning situation. Such an approach views the two models as symbiotic with the interaction of the two
types of learning being seen as mutually beneficial for the individual and the community. Salomon and Perkins (1998) also suggest there are some settings in which learning is likely to rely more on the learning processes within the individual and other situations where participation is likely to be the key mechanism of learning for both the individual and the community of practice. They put forward three propositions in relation to the nature of learning (Salomon & Perkins, 1998, pp. 17-18):

- Individual learning can be more or less socially mediated.
- Individuals can participate in the learning of a collective, sometimes with what is learned distributed throughout the collective more than in the mind of any one individual.
- Individual and social aspects of learning in both of the above senses can interact over time to strengthen one another in what might be called a “reciprocal spiral relationship”.

Learning needs to be regulated at some level by the individual and there also needs to be the capacity for self-reflection even when engaged in highly socially mediated learning. Even when learning as an individual, the knowledge obtained when articulated will eventually benefit the community. These theories can work in complementary cycles with joint active participation in tasks, then individual reflection and then further socially mediated discussion. Cobb (1994) also suggests that the way forward is to take a pragmatic approach that acknowledges the merits of both constructivism and social learning theory perspectives. From his perspective, it is important to recognise that, while a particular approach may have greater prominence in some learning circumstances, regardless of the learning situation there is likely to be an underlying background influence of the other approach.

So far a method for understanding of how constructivist and socialisation processes may occur and coexist without conflict has been proposed. However, it may initially seem more difficult to accommodate the difference in views on the transfer of learning. Following the logic of previous discussion, the issue may not be as it is often portrayed – an issue about whether knowledge is general or context specific – but rather a question of how these two types of knowledge coexist and work together (Perkins & Salomon, 1989). One of the most important commonalities in relation to the issue of transfer is the growing recognition from both constructivist and sociocultural perspectives that expertise is domain specific (Billet, 1996). Constructivist approaches acknowledge that, in the case of expertise, many of the skills and understanding associated with these skills are dependent on the situation, even though learning is still seen as a process of internalising knowledge in response to the situation. Sociocultural theories emphasise the level of engagement within the community of practice and the level of knowledge that is obtained through participation in authentic core activities within this community as the method for developing expertise. Recently there has also been an increase in
the readiness of sociocultural approaches to recognise that the issue of transfer is not an ‘all or nothing’ phenomenon. Billet (1996) discusses the transferability of knowledge in terms of near transfer and far transfer. Knowledge is seen to be applied to new situations through abstraction of knowledge within a problem solving framework. Transfer of skills to similar situations (near transfer) is considered far more likely to occur than transfer across different communities of practice (far transfer). Knowledge is initially considered to be embedded within specific social situations. The ability to apply this knowledge in different settings is therefore dependent of the individual’s ability to reapply abstracted information. The success of this is likely to be largely determined by whether the individual can perceive similarities between previous exposure to a situation and the current novel situation where a problem is presenting itself.

1.7 Summary

This chapter has reviewed and discussed how theories of learning, expertise and professional practice can all assist educators and clinicians in understanding and fostering the development of professional artistry. Discussion revealed that the development of professional artistry is complex. It requires multiple learning processes involving the construction and internalisation of knowledge in the individual and processes of socialisation within the community of practice. Historically, constructivist and sociocultural theories of learning have been seen to be in conflict due to their different philosophies on the role of the individual and the community of practice in learning and the transfer of knowledge. However, to fully describe the process of developing professional artistry there needs to be a shift in perspective to see these theories as coexisting complementary theories rather than mutually exclusive. Context becomes the moderator of the relative dominance of each learning approach and also provides indications of the likelihood that acquired knowledge will be readily transferred and generalised to another situation. Adopting a viewpoint that acknowledges the coexistence of parallel complementary constructivist and sociocultural learning processes requires the development of a new educational framework which describes how these theories can work together to facilitate the development of professional artistry.

The development of this new integrated educational framework is presented in Chapter 2. In addition to describing how these learning processes can work together in complementary cycles, this new educational framework emphasises the need to develop a greater understanding of how the context of learning influences both student learning processes and the ability to transfer and apply existing knowledge to new learning experiences. This is particularly important for the development of professional artistry given the considerable influence of processes of socialisation on the development of professional identity and understanding of how to apply knowledge and skills within a specific community of practice.
In Chapter 3, the importance of context as a mediator of learning is explored with particular reference to the dilemma of how to present authentic contextually relevant learning opportunities for students when they are not directly engaged in clinical practice. An authentic online learning module is developed as an illustrative example of how incorporating principles of instructional design into a situated learning approach may enhance learning opportunities for students by allowing context to make a more salient link between theory and the ways in which theory is applied in practice within specific professions. In the case of this research, the online learning module was developed to assist speech pathology students apply psychometric knowledge to standardised test interpretation.

Chapter 6 explores the importance of authentic context in facilitating individual learning by comparing the ability of psychology students and speech pathology students to benefit from completing the online learning model as individuals. In Chapter 7 the role of socialisation in the development of professional artistry is explored by examining the collaborative learning processes when a second, third and fourth year student complete the online learning module whilst paired with a clinical educator.
“It is easier to see the conditions in their separateness, to insist on one at the expense of the other, to make antagonists of them, than to discover a reality to which each belongs.” (Dewey, 1902, p. 4)

In Chapter 1, the development of professional artistry was described as a complex, multifaceted process which draws on knowledge from a variety of areas of study including theories of learning, expertise and clinical practice. There is growing recognition in the literature that professional practice involves learning processes that are mediated by both the individual and the community of practice. This creates a dilemma because constructivist and sociocultural theories of learning embody beliefs about the processes of learning and the nature of transfer that are considered to be incompatible. The proposed solution was to accept that multiple approaches to learning are necessary to facilitate the development of professional artistry, and that no single theory of learning can fully capture the development of professional artistry in isolation. By taking this view of coexisting theories of learning, theoretical differences become strengths that enhance understanding of learning in different contexts rather than points of conflict. Individual and social mechanisms of learning coexist to facilitate the development of professional artistry, and the relative dominance of each approach in a given learning situation is mediated by the context.

In this chapter, this solution is developed in greater detail to form a framework to guide clinical education on how to facilitate the early development of professional artistry. Discussion commences with the development of a framework that emphasises the role of the individual in learning from a constructivist perspective. A similar framework is then developed with particular reference to the role of the community in learning from a sociocultural perspective. Learning is seen as a continuous cyclic process between the two approaches. Within this integrated framework it is proposed that it is the context of learning that mediates both the degree to which individual and community based learning dominates, and the relative likelihood of the transfer of skills.

Following development of the model, discussion focuses on how educators can provide learning environments that maximise opportunities for students to learn through the construction of knowledge and processes of socialisation. It is proposed that incorporating
principles of instructional design into authentic learning opportunities provides a successful way of marrying the two approaches. The types of learning opportunities offered within an undergraduate speech pathology degree are discussed with reference to how the learning context may mediate the types of learning that dominate in these specific learning situations. Chapter 3 then addresses the challenges raised by incorporating principles of instructional design into authentic activities and uses the development of an online learning module as an illustrative example of how these principles can be applied to educational practice.

2.1 A Constructivist Perspective

2.1.1 The Individual

It is logical to begin the discussion of this model with the individual, since joining a course is the starting point for their journey to becoming a professional. When new students enter a course, they come with their existing knowledge and life experience, cognitive abilities, beliefs, identity and motivation (see Figure 1). All of these areas will undergo change throughout their journey to become health professionals and will uniquely influence their individual development and learning.

Bandura (1989) highlights the importance of individual characteristics in facilitating or hampering an individual’s ability to learn. He cites positive self-belief as a critical component in successful learning because it influences the degree of difficulty people incorporate into their goals. Without adequate faith in their ability, people have a tendency to set easily achievable goals which do not challenge their current knowledge base. Conversely when levels of self-belief are set unrealistically high, goals may be unachievable without first achieving an interim level of skill base. Therefore, having a well-developed ability to realistically reflect on one’s capabilities is also a prerequisite to the successful acquisition of these skills. Positive belief also assists people in visualising successful outcomes rather than failure. Closely linked to the concept of self-belief is the level of motivation that an individual applies to the learning process (Pea, 1987). Being motivated and committed to a goal provides an individual with a greater level of resilience when they encounter criticism or other hurdles which impede their progress (Bandura, 1989). Lack of self-belief and motivation may lead to helplessness which affects an
individual’s cognitive abilities to generate and explore possible solutions to problems. Self-belief and motivation levels may in turn affect an individual’s emotional state, in particular, levels of anxiety and depression.

Personal motivation is a key element in determining whether knowledge remains at a procedural level or goes beyond this stage to the development of schemas or mental models. In many cases procedural knowledge is enough to satisfactorily complete tasks and so people do not invest the additional cognitive effort required to formulate new models. Hatano and Inagaki (1992) propose that cognitive incongruity is the motivating factor for individuals to explore topics more deeply, because they recognise that their current level of understanding is inadequate to explain the presenting situation. Such increased knowledge can allow amendments to an existing mental model through the addition of new information, or, may allow an individual to make a more informed choice regarding two competing but initially equally plausible alternatives. To go to this level of cognitive effort, the need to comprehend must be present and the object of understanding must be perceived as valuable to the individual. They identify four situations that might create the level of cognitive incongruity needed to motivate an individual to seek greater understanding of a situation. The first situation occurs when an event does not happen in the manner predicted by the individual’s existing knowledge and promotes curiosity to explore the situation further. The second case results from dialogical interaction where an individual presents a particular point of view, but through discussion the individual becomes aware of gaps in their knowledge or logic through either the actual act of conveying the information or from the feedback of other parties contributing to the discussion. The third situation occurs when people are free of an external need to receive financial and/or social rewards, as seeking comprehension takes time and is riskier than clinging to conventional wisdom. If people are externally motivated they are likely to ignore conflicting data rather than embracing it as an opportunity to deepen understanding. The final situation occurs when the development of a greater understanding in a particular area is valued by the reference group of which the individual is a member. The value of the knowledge and beliefs to the reference group impacts on the value the individual places on investing time in enhancing knowledge in a particular area. Therefore, self-belief and motivation are not only individual traits but are also socially and culturally mediated (Pea, 1987). For example, motivation on clinical placements is higher as a learning setting because students perceive what they are learning as ‘real practice’. The opportunity to engage in practice is also essential in transforming an individual’s identity from student to clinical practitioner.

Contributions from constructivist theories of learning highlight the importance of the student’s ability to incorporate new knowledge into existing knowledge schemas. Whilst
learning is considered to be an active process completed by the individual, contemporary theories also recognise that the main processes which trigger a re-conceptualisation of existing knowledge are socially mediated through participation in activities which expose the individual to experiences or opinions that do not sit well within their existing knowledge schemas. This conflict triggers the individual to actively reorganise and/or add to their existing schemas. From a constructivist approach, learning is necessarily an active process and will only take place when the learner is willing to actively learn. The acquisition of knowledge is closely tied to the concept of motivation. Learning must be goal-directed and the individual student must be motivated by the goal. Goal-directed learners focus on aspects of learning that they perceive to be valuable to them as individuals. When examining medical students’ learning styles and learning approaches, Hilliard (1995) found that the students who employed deep learning strategies tended to be more interested and motivated to develop a greater understanding of the subject rather than performing at a certain level on an assessment task. Students who employed a strategic approach aimed at high performance on assessments were more inclined to study materials in a manner that they felt would maximise marks on the assessment tasks rather than yielding a broad understanding of the subject area.

An exploration of the nature of the individual within the learning process would not be complete without a more in depth explanation of the nature of knowledge within a constructivist approach. In many areas of psychology, developing knowledge is seen as a process of information acquisition where the learner acquires a snapshot of the information that has been presented. In contrast, in the constructivist approach the individual is using new information and adapting this information into their existing schemas. The knowledge available to the learner is adapted to be useful to them rather than simply being acquired in an unmodified state (von Glasserfeld, 1984). Individuals select and functionally adapt aspects of knowledge available to them that they perceive to be useful to them as a way of enhancing or creating new knowledge schemas. Such adaption occurs both as a result of past experience and the direct event that the individual is currently experiencing. It is the individual’s perception of the similarity of new knowledge which will determine whether the knowledge is incorporated into an existing schema or facilitates the creation of a new one (von Glasserfeld, 1984).

So far discussion has focused on how the characteristics of an individual may influence the nature of learning. Interaction with others and/or participation in activities is recognised as the primary catalyst for learning in a constructivist approach. This discussion or participation in an activity exposes the individual to information that contradicts or cannot be adequately accounted for by the individual’s existing schemas. This information, if adequately important to the individual, will result in an attempt to reorganise existing schemas or create
new schemas that adequately account for it. These adapted or new schemas then allow the internalisation of new knowledge which contributes to individual learning. This process is summarised in Figure 2.

![Figure 2: The learning process in a constructivist approach](image)

Another aspect of an individual that is highly dependent on interaction and participation in a community is the formation of identity. Identity is highly socially mediated by an individual’s aspirations and this influences both the type of person the individual attempts to be and how they set out to achieve this identity (de Ruyter & Conroy, 2002). The majority of research into identity focuses on individual’s current identities, but, in the case of students who are learning to become professionals, their yet-to-be-fully-realised ‘ideal identity’ as a health professional is important because it will influence who they are and how they act as they strive to achieve their ideal (de Ruyter & Conroy, 2002). This identity is dynamic and socially constructed through interaction between the individual and other members of the community of practice. There is also an important individual component to the process of developing an identity. The community of practice reveals the ideal traits and characteristics of a health professional. The learner must select the traits that they perceive as ideal and worth investing time and effort to develop their own identity. The formation of identity is very important for educators to acknowledge as it can be an important source of motivation for the individual by giving them a sense of purpose and direction (de Ruyter & Conroy, 2002). This may also influence the perceived relevance of particular learning activities to the individual.
2.1.2 The Community

One of the criticisms of constructivist approaches is their tendency to downplay the importance of the community in learning. Davis and Sumara (2002) discuss the philosophical difference between the two major forms of constructivism as reflecting the dyad of knowledge and knowing. They describe the first form of constructivism as being subject centred and concerned with how individuals learn through constructing their own understanding of experiences. In contrast, social constructivism is concerned with how knowledge is socially constructed. They describe the differences as how “the individual constructs the world to the manner in which the world constructs the individual” (Davis & Sumara, 2002, p. 414). They suggest that although these two forms of constructivist theories appear poles apart, in reality the differences between these theories are not always so extreme. By recognising that participation is the most common catalyst for the development of individual learning, the constructivist approaches, regardless of their philosophical background, do recognise that the community has an important role in the learning process. A constructivist approach is incomplete without some recognition of the role of the community in facilitating learning. Whilst in approaches emphasising the individual, the community is not seen to directly cause learning to occur, it is the members of the community and the collective beliefs, history, tools and existing knowledge base within the community that challenges the schemas of the individual and causes them to make changes to their existing schemas. Therefore, although social mechanisms of learning do not play a primary role in constructivist approaches, the community also needs to be added to the model to recognise how community knowledge and participation within activities in the community provides opportunities for individuals to reflect on, and, where necessary, adapt their knowledge schemas. In effect, the community helps the individual to make sense of the presenting situation. Figure 3 provides a summary of the completed constructivist approach.

![Figure 3: A constructivist framework for learning](image-url)
So far, a view of the development of knowledge was presented with the individual selecting knowledge from participation in the environment and then incorporating that knowledge to adapt or create new schemas. These schemas are directed by the individual, but if the knowledge is not accepted in the community, the validity of the manner in which knowledge has been constructed by the individual will be questioned. Following on from the Darwinian concept of survival of the fittest, only viable knowledge will continue to exist in individual’s schemas and the viability of such knowledge will be moderated by both the individual’s experience and the perceived viability of the individual’s knowledge within the community of practice. As von Glasserfeld (1984, p. 22) states: “In nature, a lack of fitness is invariably fatal; philosophers, however, rarely die of their inadequate ideas. In the history of ideas it is not a question of survival, but one of ‘truth’.” Therefore whilst the individual constructs their own knowledge schemas, the viability of these schemas will be moderated by the perceived ‘truth’ of the schemas when they are tested within the community of practice. Similarly, the way in which knowledge is organised and ways tools are used within a specific community of practice will influence the way an individual integrates existing or new knowledge into their schemas or creates new schemas. Schemas must be created in a manner that allows the efficient organisation of information within the context of the functions that need to be employed within the specific community of practice. Therefore the process of socialisation can moderate the individual’s organisation and prioritisation of information. This view is reflected in the work of Rogoff (1990, p. 7) when she states:

A broader view of cognition and context requires that the task characteristics and cognitive performance be considered in the light of the goal of the activity and its interpersonal and sociocultural context. The purpose of thinking is to act effectively; activities are goal directed (tacitly or explicitly), with social and cultural definition of goals and means of handling problems.

Even when constructivist approaches are the dominant learning process, the community and activities within the community have an important role to play in moderating learning. In the next section, discussion continues to examine the role of the community in facilitating learning as the focus of discussion and turns to how sociocultural theories of learning can be incorporated into the model.

2.2 A Sociocultural Perspective

2.2.1 The Community

In contrast to the constructivist approach, in the sociocultural approach to learning the fundamental starting point for all learning is considered to be within the community (Figure
4). The community has a rich history of practice that informs the current knowledge base, beliefs and tools. It is these tools, beliefs and rich knowledge base that assist members to carry out the core activities within the community. In the sociocultural perspective, the process of socialisation within the community is the main mechanism for the generation of knowledge. Knowledge is created through members of the community engaging in authentic practice within the community. When teaching, experienced members of the community draw not only on their individual knowledge, but also on the collective knowledge generated by the community of practice. The wealth of knowledge surrounding past and present best practice provides methodology for completing activities within the community. Cultural tools such as language, books, manuals, technology and other pieces of equipment allow activities to be completed efficiently in a manner that is culturally acceptable to the community.

The importance of the cultural scaffolding provided by the community should not be underestimated. There is a body of social learning theory research specifically devoted to understanding social mediation through cultural scaffolding (Salomon & Perkins, 1998). In this approach, even when a learner is not directly engaged in a social interaction with other individuals, exploring books, media and technology presentations, and other tools can assist with the socialisation of the learner because the content of these materials is based on historical and contemporary cultural beliefs about practice within the community. These tools are usually developed to create a methodology to complete core activities rather than as a learning tool. Inadvertently, when developing these tools, the authors are also developing a guide to practice and practitioners within the community. Such guides may suggest a better methodology for a person to use to complete an activity or may be information sources to convey or scaffold ideas. Salomon and Perkins (1998) discuss two ways that tools can have an impact on learning; the effect of tools and the effect with tools. The effect of tools more closely parallels the constructivist approach to social learning theory and is concerned with the cognitive changes that may occur within the individual which enable them to expand their ability following exposure to cultural tools. In contrast the effect with tools is more akin to the sociocultural approach which has broader reaching implications than enhanced performance on a type of task. In this case the emphasis is not on what the tool can do for the individual but rather how the individual uses the tool to participate in activities, and how this in turn contributes to the community’s knowledge base. Computer technology provides an excellent example of this. Computers are now used as cultural tools rather than simply word processors; the way knowledge is presented is strongly influenced by the culture of the community which designs the computer programs. In many cases the tools of a community also convey the values of the community, for example the dominance of computers has placed greater emphasis on typing speed than on the legibility of handwriting in contemporary society (Salomon & Perkins, 1998).
In sociocultural perspectives, when a new student enters the community, their individual characteristics are not of immediate concern. The main concern for these approaches is the socialisation of new members within the community, and learning is almost seen as a by-product of this socialisation approach. Progress is not viewed in terms of expansion of the student’s knowledge base (although this naturally happens through the socialisation process) but rather through increased participation in the core activities of the community. The mechanism for this process is described by Lave and Wenger (1991) as Legitimate Peripheral Participation (LPP). In this process students initially take a very minimal role such as observation and then gradually take more responsibility for individually completing the core components of the essential tasks within the community. Wenger (1998, p. 4) identifies four fundamental assumptions of social learning theory:

- We are social beings and this is central to our ability to learn.
- Knowledge is competence in tasks valued by the community to which we belong.
- We learn to know through active participation in the tasks that define our community.
- Learning is about producing meaning and an individual’s ability to experience and engage in the world in a meaningful manner.

Social participation is considered paramount in this theory and includes both being an active participant and developing an identity within a community. Social participation in a community is characterised by three components: meaning, practice, and community. Meaning is discussed as “learning as experience” and “a way of talking about (changing) ability” (Wenger, 1998, p. 5). The meta-cognitive processes required to develop meaning occur at both an individual and community level. Practice is described as “learning as doing” (Wenger, 1998, p. 5) and is concerned with the information that a community shares. It is the common ideology that links participants through the use of shared cultural and historical resources and beliefs, theories, frameworks and points of reference. These provide common goals and beliefs about actions within the community. Community is described as “learning as belonging” (Wenger, 1998, p. 5). Community describes the social structure which identifies common goals and defines levels of participation which then define competence. The process of learning within a sociocultural approach is outlined in Figure 5.
When the objective is to move towards greater participation, it changes the goals of learning and the resources necessary to support learning and to understand the process of learning. For communities, there are two essential learning-related tasks: the recruitment of new members to ensure the longevity and sustainability of the community; and the constant revision of practice within the community (Wenger, 1998). Learning is a dynamic and constantly evolving process both for the individual and the communities of practice. At the level of an individual, learning is about participating, developing an identity as a member of the community, and making a contribution to the community. The role of the individual within this framework is explored in more detail in the next section.

2.2.2 The Individual

Sociocultural approaches have often been criticised for not giving adequate attention to the individual in terms of learning. However, the experience of the individual is acknowledged within this framework. For example, Brown and Duguid (1993) recognise that two individuals entering the same learning situation are not identically situated. This may relate to differences in socialisation within communities of practice but there will also be features unique to the individual including their current motivation, beliefs and prior experiences and knowledge that will individually modify their learning experience. For the most part, though, social learning theories, whilst recognising that the individual does have some influence on the learning processes, maintain that these are socially mediated. For example, within this approach there is recognition that individuals can enhance the collective knowledge of the community through the exploration and use of new techniques and insights into practice. Furthermore, whilst not emphasising the internal nature of learning within the individual, sociocultural theories do provide much greater recognition of the development of an individual’s identity and the process of individual professionalisation within the community of practice than constructivist approaches. The completed sociocultural model is outlined in Figure 6.
Contributions from theories of expertise and practice also highlight how, over time and through exposure to practice, the knowledge bases of the individual become more integrated and allow for more automatic pattern recognition, greater efficiency for problem solving and a greater capacity for self-reflection to emerge. The engagement in authentic practice is the key mechanism to facilitate personal growth within these areas within a sociocultural approach. Examining learning within a sociocultural perspective requires a re-conceptualisation of the nature of learning. Brown and Duguid (1993) refer to learning in a sociocultural approach as stolen knowledge because, in this approach, the emphasis is on participation rather than learning through specific instruction. Consequently the knowledge individuals acquire (both explicit and tacit) is through experiencing rather than being given deliberate instruction. From a situated learning perspective the learner demands what knowledge they require rather than institutions supplying knowledge (Brown & Duguid, 1993).

Figure 6: A sociocultural framework of learning

2.3 An Integrated Framework

In her article, Sfard (1998) describes the competing types of learning using the acquisition and participation metaphors. In the acquisition metaphor the focus is on acquiring knowledge whereas the participation metaphor is concerned with knowing. These slight semantic shifts hide larger theoretical shifts which may initially seem insurmountable to educators. However, she suggests that by seeing the approaches as complementary and coexisting, many of the weaknesses of each theory can be addressed by strengths in the other. For example, in the case of theories emphasising acquisition of knowledge such as constructivist approaches, there has always been the problem of how such theories account for the initial learning of something completely new when an individual has no existing internal schemas with which to build with. Processes of socialisation may provide the solution to the dilemmas of these theoretical approaches. Another critical question for acquisition approaches
to learning has been to explain the degree of commonality in the community’s understanding of concepts if individuals independently construct their own individual knowledge schemas. In both cases, the criticisms of these acquisition approaches can be addressed by the participation metaphor. When there is an acknowledgement of the impact of socialisation approaches on learning, the process of socialisation and participation can scaffold an individual’s learning within unfamiliar situations and provide the structures necessary to facilitate new learning when internal schemas on their own would not be adequate. In the case of commonality of learning amongst individuals, socially mediated ‘truth’ influences which schemas reach equilibrium and which schemas are challenged and modified until they reach consensus with socially mediated knowledge. Acknowledgement of coexisting social influences of learning can strengthen constructivist approaches by providing solutions to the fundamental criticisms of such approaches.

In the case of participation approaches to learning, there are also some areas of criticism that can be addressed by acknowledging the influence of acquisition approaches. One of the biggest issues for the participation approach that will be discussed in the following section is transfer. Sfard (1998) suggests most of the efforts of participation approaches have been aimed at proving that transfer does not occur. For participation approaches she contends that the real issue is not that transfer cannot occur but rather that the traditional views of transfer are incompatible with these approaches. However, any discussion of learning and theories of how learning occurs, no matter how contextualised it is stated to be, requires a degree of abstraction on the part of the theorist (Sfard, 1998). Constructivist approaches, when combined with participation approaches, may provide an understanding of what learners are able to abstract and transfer between situations and an explanation for an underlying mechanism for how this may happen.

Cobb (1994) also discusses the polarisation of constructivist and social learning theory approaches in the context of learning mathematics. He summarises the core differences in approaches as determining whether the mind is located in the head of the individual or the individual-in-social-action. Equally important are the differences in opinion about the nature of development. From a constructivist perspective, development can be seen as the internal self-organisation of knowledge. In contrast, from a sociocultural perspective, knowledge can be viewed as the enculturation of the individual into the community of practice. Cobb (1994) considers that the approaches have the potential to be viewed as complementary if social learning theory is seen to inform educators about the contexts of learning and constructivist approaches are seen to offer insights into what students learn and the processes underlying learning.
There is now a recognition that study based solely on the individual without due consideration of the social context and the interactions within it is unlikely to result in a complete understanding of learning processes. The converse of this is also true (Salomon & Perkins, 1998). Both Salomon and Perkins (1998) and Cobb (2004) challenge researchers to see the merits in both the features of an individual and also the broader social context and interactions within it that facilitate learning. They argue that both approaches can complement each other and encourage examination of the interrelationships between these approaches rather than the differences. On the surface, constructivist and sociocultural approaches to learning appear to be at opposite ends of the spectrum, especially in terms of the perceived importance of context in facilitating learning. On the one hand, constructivist theories emphasising the individual suggest that the context is not crucial and that there is the possibility of transfer of knowledge. On the other hand, sociocultural theories emphasise socialisation as the mechanism for learning, stress the importance of authentic contexts for learning, and maintain that learning is domain specific with little opportunity for transfer of learning. However, it is possible to integrate both perspectives of learning into a single framework that recognises that both approaches coexist, but one may have greater dominance over the other in any given learning situation. In this framework the characteristics of the individual and the individual’s learning can be seen as equally important as the process of socialisation and the subsequent increase in participation and development of identity that occurs through exposure to the core activities within the community. The way forward for educators is to see these approaches as complementary rather than conflicting with each other. Learning is mediated by both the construction and internalisation of knowledge in the individual, and by the processes of socialisation that gradually increase the ability of students to participate in the core activities of the community and facilitate the changes in personal identity that occur when becoming a member of that community. Figure 7 displays the proposed integrated model that incorporates both constructivist and sociocultural processes of learning.
Figure 7: An integrated educational framework

It is the context of learning that mediates the relative dominance of these two loops. Both types of learning are always likely to be present, but the relative dominance of the particular learning approach is dependent on the context. For example, in some contexts, such as a student studying a text book on language disorders, the dominant type of learning is likely to emphasise the individual actively constructing and internalising knowledge from the information contained within the text. Whilst this method dominates, it is important to recognise that the text book is actually a cultural tool from within the community of practice which reflects the history, beliefs, techniques and current practice surrounding the topic of language disorders. Therefore, even though the student is engaged in an activity which limits the opportunities for socialisation to mediate learning, the use of a cultural tool from the community still makes a contribution to assisting the student to build the skills and knowledge necessary to participate in the core practice of the community. The integrated model demonstrating the constructivist loop as the dominant (red) learning pathway is shown in Figure 8.
Conversely, when a student is on a clinical placement the dominant learning process is likely to be socialisation through engagement in the core activities of clinical practice. There will still be a process of internalisation occurring as new experiences are compared and reconciled with the student’s existing knowledge base and theoretical knowledge is transformed and applied to clinical practice. The integrated model demonstrating the socialisation loop as the dominant learning pathway (red) is shown in Figure 9.

The next two sections expand on how context and the process of transfer mediate learning and the relative dominance of the constructivist and sociocultural loops. The discussion
then explores how this framework can guide educators to maximise learning opportunities within a variety of educational contexts.

2.4 Context as the Mediator for Learning

In the previous section, the integrated framework combining both constructivist and sociocultural learning loops was introduced. It was argued that both constructivist and sociocultural learning loops coexist as complementary learning processes, and that the context of specific learning opportunities determines the relative dominance of the constructivist or sociocultural loop. In this section the relative dominance of these two loops are explored through an examination of the types of learning contexts that students are exposed to in the classroom and on clinical placement.

Before beginning the examination of the types of learning contexts available for students, a re-examination of the term clinical education is necessary. Historically there has been a distinction made between learning opportunities in the tertiary environment, commonly referred to as the academic component of the course, and the clinical or practical components of the course, which are referred to as clinical education. Viewing the components of courses in this manner fosters the dichotomy between theory and practice. This is an unhelpful way to view components of training programs, given that clinical expertise demands the integration and transformation of theory into clinical practice, and that practice also guides the development of theory. Instead, a more integrated approach considers all professional preparation, including classroom based learning, as part of the process of clinical education. Within this broad conceptualisation of clinical education students are provided with a range of learning contexts. These learning experiences provide a variety of learning opportunities, some of which favour constructivist approaches to learning, and others which provide greater opportunities for socialisation to be the dominant process of learning.

Context moderates the relative dominance of each learning loop by moderating the degree of authenticity within learning environments. Before explaining how this occurs, the definition of authenticity within this thesis must be discussed. In this thesis, many of the issues relating to learning are relevant to a range of health professionals. However, the specific motivation of exploring the nature of learning in this thesis was to provide new insights into how to improve learning opportunities for speech pathology students.

Herrington & Kervin (1997, p. 223) describe authentic activities as “…the kind of activities that people do in the real world.” Authenticity of activities therefore is a measure of how congruent the learning context is with the core activities of the speech pathology community of practice. Authenticity is on a continuum from learning activities that have a low
correspondence with core speech pathology practices (for example, attending an anatomy lecture), to activities with a high level of authenticity (for example, participating in a therapy session). When discussing context as a mediator for learning, there is an inherent danger of developing yet another dichotomy of de-contextualised and contextualised activities. This should be avoided for two reasons. Firstly, there is no such thing as de-contextualised learning. All learning has a context, even in the most controlled experimental conditions. What is important about context is how closely (or not) the context and activities of learning resemble those participated in within the community of practice. Secondly, as demonstrated by the two loops of the integrated approach, the authenticity of activities is not an ‘all or nothing’ phenomenon but rather should be seen to be on a continuum.

It is argued that the authenticity of the activities is mediated by the learning context. The level of authenticity also influences the relative dominance of specific learning processes as depicted in Figure 10. Discussion has already identified internalisation as a key learning mechanism of constructivist learning approaches, and socialisation as the main process in sociocultural approaches to learning. These are included in the integrated learning framework presented earlier in this thesis. However, using only these two terms provides very little indication of the processes that occur when activities have moderate levels of authenticity, and therefore may employ elements of both the constructivist and sociocultural loops without either being dominant. In these cases, appropriation is considered to be the best descriptor of learning processes, which involve the individual still constructing knowledge but with a more significant influence of socialisation from the community of practice than would typically be acknowledged from a pure constructivist perspective. Appropriation was proposed as a description of learning processes by Rogoff (1990) because she felt that the term internalisation did not adequately reflect the importance of participation in the transformation of learning. Both the learner and the source of learning are transformed by engagement in activity (Billet, 1998). To emphasise the active nature of the individual within this process of creating knowledge, Rogoff (1995) sometimes refers to this process as participatory appropriation because through participation people do not just acquire knowledge (internalisation), but they also change the way they engage in future activities based on their engagement in previous activities. This is seen as a way of becoming rather than simply acquiring knowledge (Rogoff, 1995). This is a different process to socialisation as it continues to emphasise the individual’s internal role in the
process more than the community’s. Appropriation in this sense describes the middle ground of learning processes which values both the role of the individual and participation as mediators in the development of knowledge and identity. Appropriation is not specifically represented in the diagrammatic representations of the integrated educational framework as it adds additional complexity and the coexistence and relative dominance of both loops on a continuum has already been acknowledged. However, to aid conceptualisation of the continuum of learning processes, appropriation could be incorporated into the framework as outlined in Figure 11.

![Diagram](image)

**Figure 11: Appropriation in the integrated educational framework**

The remainder of this section provides illustrative examples of activities with low, medium and high levels of authenticity and considers the implications for learning with reference to the educational framework.

Learning that occurs in lectures presented by other disciplines such as psychology, biosciences and linguistics are likely to have the lowest levels of authenticity in relation to their correspondence with core practices within the speech pathology community of practice. As an example, let us consider a speech pathology student attending an anatomy lecture. There are three key areas that lower the level of authenticity of this task for speech pathology students: the background of the presenter, the content of the learning activity, and the nature of the learning activity. The lecturer of anatomy is unlikely to belong to the speech pathology community of practice. Therefore, the beliefs, tools, knowledge and values of the lecturer belong to a different community of practice to the speech pathology students. The lecturer’s community of practice
will impact on the selection of content (although this will also have been approved by the speech pathology faculty), illustrative examples provided, and teaching methods employed by the lecturer in accordance with best practice within their discipline of expertise.

There are certainly has some advantages in relation to the currency and quality of the content being taught by an expert in the field such as anatomy. However the socialisation provided by these lectures involves socialisation into the field of anatomy rather than socialisation into the speech pathology community. The degree of transformation required to apply knowledge from other disciplines to a speech pathology context is greatest when knowledge is obtained from other disciplines. In addition to the impact of the presenter and the presentation of content, the didactic nature of lectures and the typical focus on the development of declarative knowledge also reduces the opportunity for processes of socialisation to foster learning. Instead, constructivist pathways of learning are likely to dominate this type of learning scenario.

Before moving discussion to an activity demonstrating a moderate level of authenticity, a few qualifications about activities with lower levels of authenticity need to be made. Firstly, whether a term like ‘de-contextualised learning’ or ‘low authenticity’ is used to describe activities, there is an inescapable negative connotation associated with these two terms when compared with their antonyms. In the literature proponents of situated learning and sociocultural approaches have been scathing in their attitude towards activities that they do not consider to be examples of authentic practice. Such connotations in this thesis, if they exist, are unintended. Instead, a more moderate view is taken that suggests the varied nature of learning contexts have much to offer students, provided that educators are aware of the underlying learning processes and challenges associated with each. For example, exposure to the viewpoints of practitioners from a variety of communities of practice broadens the perspectives of students and is likely to also broaden their background knowledge beyond the parameters of speech pathology. Both of these results can be considered to be positive, especially in regard to the student’s appreciation of the perspectives of other communities of practice. However, educators also need to be mindful that, without the opportunities for socialisation, a greater level of transformation is required to enable students to integrate this new knowledge into the context of speech pathology practice. Without social support that explicitly links this knowledge to the speech pathology context, students may not be aware of the significance and value of transforming and integrating this knowledge into their clinical practice (consequential validity), which may have negative implications for their motivation and willingness to engage in deeper learning strategies in these subjects.
An example of an activity with a moderate level of authenticity involves a student attending a problem-based learning tutorial about assessment in speech disorders. The tutorial takes place within a classroom at university. The facilitator of the tutorial is likely to be a speech pathologist, and so knowledge imparted to the students will reflect the common views and beliefs of the speech pathology community. The case-based presentation of content also has a closer resemblance to the presentation of information in core speech pathology activities. However, due to time limitations in tutorials, it is a written case study where information is already collated for students; their task being to complete questions relating to the case study. The opportunities to work with peers more closely resembles the collaborative nature of discussion in clinical settings, although the opportunity to consult with other allied health professionals and opportunity to integrate information from multiple sources is not present in this learning activity. Classroom discussion surrounding student confusion concerning the differentiation between phonological and articulation disorders when exploring the case provides opportunities for students to consolidate and begin to transform their theoretical understanding of speech disorders into principles of clinical practice. At this level of authenticity students are likely to expand their knowledge through both individual and social mechanisms of learning. Learning is likely to simultaneously combine both individual and social processes of learning through a process of appropriation.

However, the situation above lacks the high level of authenticity present in the complexity of a real life clinical environment. To illustrate this, the same example of a child being referred for assessment of their speech in the above tutorial example will now be considered in a real life clinical setting. The student now has the same benefit of a clinical educator with a common background in speech pathology. In addition, the student has the opportunity to collaborate with the occupational therapist who also works with the client. The assessment must be selected from the available resources in the clinic and information about the client contained within the client’s file. The assessment and subsequent interpretation of results must now be completed in real time with the majority of opportunities for student assistance occurring prior to and after the clinical session. Not only must the student have a theoretical and procedural understanding of the assessment process, but they must also simultaneously manage parental anxiety, giving appropriate feedback online, and keeping the child relaxed and motivated without compromising the assessment process. The student may also have the collegial support of other students if the placement is a student unit, including students who are further through the speech pathology degree. They are also exposed to the views of other speech pathologists and allied health team members both in meetings and in the tea room. The high level of authenticity in real life clinic scenarios is very motivating for students and provides multiple opportunities for socialisation into the speech pathology community of practice.
Due to the complexity of the clinical learning environment and the multiple simultaneous demands, the high level of authenticity is not always the most conducive learning environment for the initial development of new skills. The challenge for educators is determining how to maximise the learning opportunities for students by establishing optimal learning contexts for the development of different types and levels of knowledge and skills, and ensuring that they create opportunities to overtly demonstrate the importance of knowledge acquired from other disciplines and its application within speech pathology practice. The next section explores the nature of transfer and how constructivist and sociocultural views of learning can guide educators in the selection, design and development of educational activities across the continuum of authenticity.

2.5 Learning and Transfer

“Competence means being able to repeat what can be repeated while changing what needs to be changed.” (Sfard, 1998, p. 9)

Developing competence requires an ability to acquire a body of knowledge over time and recognise, retrieve and adapt this knowledge to meet the demands of new situations. Underpinning this important competency is the concept of transfer. It is vitally important for educators that learning experiences have learning effects beyond the specific content of the presented learning activity (Bransford & Schwartz, 1999). The ability to adapt and transfer knowledge to new presenting situations is becoming increasingly critical, given the rate of technological and conceptual advances and the shift in clinical focus from medical models to models which value patient-centred practice. The ability to seamlessly transfer, adapt and apply knowledge to new clinical situations is one of the most powerful ways that clinicians demonstrate professional artistry. Given the importance of understanding the nature of transfer and the optimal conditions needed to facilitate transfer, there has been considerable research devoted to this area of study in the fields of psychology, education and expertise. This research has been difficult to interpret and has yielded mixed results about the nature and contexts required for successful transfer. What has become clear is that the mechanisms of transfer are not straightforward and successful instances of traditional concepts of transfer are rare. Some of the variation in the literature may reflect differences in methodology but it also reflects differences in the types of skills that the studies require participants to transfer. It appears that some skills may transfer more readily than others, so there needs to be a change in direction in research from proving or disproving the ability to transfer knowledge to identifying the types of knowledge that do and do not transfer well. Such knowledge could guide educators in the selection and design of appropriate learning experiences to maximise learning.
Bransford and Schwartz’s (1999) contemporary conceptualisation of transfer as a ‘readiness for future learning’ may provide important insights into how to support and facilitate the early stages of transfer, particularly when examining the early transfer of skills in novice students. In this section the nature of transfer is discussed with reference to both the findings of traditional views of transfer and this new contemporary approach. Discussion then turns to the issue of transfer in sociocultural theories of learning which are commonly misinterpreted as disputing the existence of transfer due to their beliefs regarding learning as being context bound. The final section of this chapter combines knowledge of the nature of transfer with the integrated educational framework to provide new insights into curriculum development across the continuum of authenticity.

### 2.5.1 Learning and Retrieval as a Process of Transfer

So far this chapter has focused on the development of a learning framework which describes how both the individual and the community of practice may contribute to learning. Underpinning this framework is an assumption of the ability to transform, adapt and apply knowledge and learning to new situations. To commence a discussion on transfer, an initial exploration of the concept of transfer is necessary to describe the underlying relationship between transfer, retention and learning. This thesis adopts Voss’s (1987) view that the concept of transfer should be seen as having primacy, with both learning and retention being seen as subordinate examples of types of transfer. His rationale for the subordinate nature of learning to the process of transfer relates to the idea that all individuals bring to each new situation their individual experiences, motivations and abilities which may have a positive or negative impact on the individual’s ability to transfer knowledge in a given situation. Learning therefore can be conceptualised not only as the acquisition of new knowledge but also as the application of existing knowledge and the subsequent integration of new knowledge into existing knowledge.

In the Chapter 1, a common theme amongst theories of expertise, learning and professional practice was that high levels of integration of knowledge were correlated with high levels of performance within these respective domains. This view is consistent with Voss’s (1987) understanding of transfer which proposes that the depth of learning can be equated with the degree to which new knowledge is integrated with old knowledge. New knowledge that is integrated with only a small section of old knowledge is less likely to be retrieved as easily as new knowledge integrated with larger amounts of old knowledge incorporating multiple domains. This greater incorporation of knowledge also provides greater flexibility in terms of how such new knowledge can be applied in subsequent situations. More capable learners may be characterised by both a broader range of prior knowledge and better organisational and processing strategies to utilise and retrieve new knowledge.
Just as learning has been reconceptualised as a process of transfer, so too must the concept of retention within Voss’s framework. Retention is not simply the availability of information for recall; rather it is a process of transfer whereby through recalling a past experience the individual is able to transfer specific knowledge from a past experience to a new experience. Within this framework, Voss (1987) goes further to argue that transfer can be conceived as a process of problem solving. Underlying this process are two assumptions: that individuals have a natural desire to reduce uncertainty by searching for an unambiguous conclusion through the use of previously acquired knowledge; and that the individual and the learning environment cannot be separated. He describes learning as a pattern recognition process to minimise the processing effort required to come to a conclusion. The nature of the problem will determine the degree of processing required. Three possible scenarios have been outlined by Voss (1987). For very simple and familiar scenarios, processing is highly efficient and automatic; formulating the answer requires a straight representation of prior knowledge without need for modification (for example, naming a capital city). In the second scenario, an individual has some prior knowledge but has to transform existing knowledge in order to complete the task (for example reading a text passage and then transforming the information into a diagram). In the third scenario, the problem may represent an ill-defined complex problem. The presenting problem is unique, so the individual cannot draw on an existing framework. However, they can draw more broadly on their previous knowledge to develop a series of action steps or broad properties of specific situations they have previously encountered. Individuals use this knowledge to guide them in setting parameters, goals and choosing a method of problem-solving that will take them forward in resolving the unknown problem. How an individual stores and organises information can greatly enhance retrieval and this transfer of information even in the case of poorly defined problems.

The theory of learning as a process of transfer rests on the assumption that learning is a cumulative process. What is not well understood is the nature of transfer, and how best to teach students in a manner that maximises their ability to transfer knowledge when they encounter new situations. Contextual cues sometimes play a significant part, with research demonstrating that individuals have difficulty applying knowledge to new scenarios requiring identical solution processes because they lack the information embedded in contextual cues. Within specific domains there is evidence to suggest that, when individuals have existing knowledge in specific domains, there are opportunities for positive knowledge transfer. However, the nature of such knowledge transfer tends to be quite specific. For example, when examining the difference between naive college students who had no formal economics background and novice economic students who had been engaged in introductory economics courses, no difference in performance was found between the ability of the two groups to
answer some everyday life economics questions (Voss, Blais, Means, Greene, & Ahwesh, 1986). The authors suggested that the lack of transfer may reflect the focus of introductory courses on building understanding of foundation concepts in economics, and this knowledge may be too removed from the application of these concepts to everyday economic situations. Hence, although students had been given the tools and knowledge in class that would enable them to have the potential to produce more sophisticated answers to everyday economics questions than naive students, they were unable to recognise the applicability of their theoretical knowledge to economic questions when they were presented in an everyday context.

Voss (1987) suggests that from an instructional perspective, greater weight needs to be placed on explaining the relationships between pieces of knowledge to emphasise how they are integrated. Highlighting relationships between knowledge rather than emphasising the recall of specific knowledge may facilitate better organisation, which allows students to more readily integrate knowledge in a manner that enhances the potential for transfer. This idea is explored in greater detail in the final section of this chapter outlining educational implications of applying an integrated framework of learning.

2.5.2 Traditional Views of Transfer

Traditional views of transfer have conceptualised transfer as a process in which learners apply what they have learnt in a previous situation to a new situation. These traditional approaches to transfer have resulted in the development of a standard methodology in which participants are presented with a learning task, required to explore the task and then provided with a methodology to derive the solution. A subsequent task is then presented which requires the participants to apply the same knowledge to reach the desired solution, often by recognising the analogy between the two problems. Bransford and Schwartz (1999) describe this traditional methodology for the study of transfer as sequestered problem solving (SPS) because these learning studies often take place under highly controlled experimental conditions where there is no opportunity for participants to look at other resources (people and information), seek feedback, or revise their existing knowledge. They note that another key feature of these approaches is the emphasis on direct application (DA) through a final transfer task as their measurement of whether or not transfer has occurred. Two well-known examples utilising this type of methodology involved the Missionary-Cannibal problem and the Jealous Husbands problem (Reed, Ernst, & Banerji, 1974). Both of these problems require participants to move people from one side of a river to another under certain conditions such as the number of missionaries to cannibals or the grouping of husbands and wives. They found that, when students were exposed to both problems, there was no significant transfer between the problems when participants were not informed of the similarities between problems. Even when provided
with specific information outlining the similarities between the problems there was only a significant difference in performance when participants initially completed the more complex Jealous Husbands problem. Furthermore, when asked to explain the strategy they used to solve the two problems the majority of participants did not credit solving the previous puzzle as the strategy they used to complete the second problem (Reed, Ernst, & Banerji, 1974). These inconclusive results about the occurrence of transfer have been acknowledged in detailed reviews of research into transfer following SPS and DA approaches (Anderson, Reder, & Simon, 1996; Bransford & Schwartz, 1999). These studies have made positive contributions by raising a number of issues relating to transfer including increasing the focus on the merits of different kinds of learning experiences, highlighting that transfer can only occur with adequate initial learning, highlighting the relationship between learning and retrieval, and identifying the greater positive impact being engaged in problem solving rather than being presented with factual information. Other contributions include the use of concrete examples to facilitate transfer, providing ‘what if’ prompts to broaden thinking, allowing problems to be viewed from multiple perspectives, and fostering the development of metacognition in participants to facilitate greater reflection on learning strategies and their application to specific problems (Bransford & Schwartz, 1999).

2.5.3 Transfer as Preparation for Further Learning

In response to the low success rates of transfer being reported in traditional studies of transfer, there have been recent attempts to reconceptualise the nature of transfer. A less prominent view of transfer is to consider it not as an ‘all or nothing’ phenomenon but rather as a facilitation of a participant’s readiness to engage in further learning. This approach is referred to as the ‘preparation for future learning’ (PFL) approach (Bransford & Schwartz, 1999) and is viewed as an additional rather than competing view of how transfer of knowledge can be conceptualised and studied. In contrast to the traditional studies of transfer, investigations into this type of transfer typically occur in settings where there are rich sources of knowledge available to participants, which greatly increases the compatibility of this approach with notions of transfer within a sociocultural approach. This approach looks at transfer from the perspective of how it impacts on future learning – in essence the question of transfer changes from did transfer occur to how did learning one skill have an impact on learning a related skill. They suggest that when transfer is measured as a traditional ‘all-or-none’ issue, some positive signs of transfer can be missed, and consequently the potential for some kind of transfer to occur may be underestimated. The all-or-none approaches may work well when studying experts but may not be adequately sensitive to depict smaller changes of development in the case of novices (Bransford & Schwartz, 1999). The power of this approach to provide additional information is
best revealed through an illustrative example. An unpublished study by the authors and Kay Burgess and Sean Brophy (1998 cited in Bransford & Schwartz, 1999) examined fifth graders’ and college students’ comparative abilities to develop an eagle recovery plan to protect eagles from extinction. Neither group was given explicit instructions on eagles – they were expected to use their general school experience in science to construct a plan. Both groups failed in the task by not considering important issues (for example, the risk of human imprinting when rearing orphaned birds). Had the experiment been examined using only a traditional view of transfer that would be the end of the story, however, the authors also investigated the learning of the students by asking them to generate a list of further areas and questions that they needed to research to enable them to design better recovery plans. When the questions of the two groups were examined there were considerable differences in the types of questions students raised. The fifth grader students were concerned with asking questions about individual eagles (for example “What do they eat?”) whereas the college students made use of their more advanced school experience of general biology to ask questions that revealed an understanding of the interdependence between the eagles and their habitat (for example: “What type of ecosystem supports eagles?”). Analysis of the responses to these questions reveals considerable differences in learning performance between the two groups, despite both groups having failed to apply existing knowledge to generate an adequate eagle protection plan. It also demonstrates that the college students had much greater ability to apply their previous knowledge in biology for successful future learning than the younger fifth grade students. Under this new view of transfer, the college students’ ability to generate appropriate questions for future learning would be considered as a successful instance of transfer despite their inability to currently formulate an adequate eagle protection plan.

Bransford and Schwartz (1999) liken this view of transfer to Broudy’s (1977) descriptions of different types of knowing. He discusses concepts of ‘knowing that’ (replicative knowledge) and ‘knowing how’ (applicative knowledge) which are targeted in traditional measures of transfer. However, he also argues that there is an equally important kind of knowledge he referred to as ‘knowing with’ which is concerned with how previous experiences and conceptual knowledge impact on the way an individual perceives, judges and interprets presenting situations. Much of this type of knowledge is considered to be tacit in nature. Bransford and Schwartz (1999) conclude that it is the differences in ‘knowing with’ that accounted for the differences in responses between the fifth grade and college students in the type of questions that they asked. Their past experience of biology, even though it did not include specific studies of eagles, helped the college students identify and frame more important questions (for example knowledge of ecosystems for all animals including eagles is important when setting up an appropriate recovery centre). They suggest that ‘knowing with’ is likely to
be the mechanism which allows rapid pattern recognition and problem solving by experts, because their knowledge is much more differentiated than novices, and novices often have difficulty differentiating important information from extraneous details. To test this theory, Bransford and Schwartz (1999) proposed that providing students with contrasting cases might facilitate more differentiated learning in novice students. They tested this theory using a learning task which involved improving students’ understanding of memory concepts. They hypothesised that if students were given a simplified set of data and were asked to discover the results of contrasting experiments they would develop a deeper, better differentiated understanding than if they had just been reading and summarising information about the data. They proposed that this deeper original learning would facilitate greater future learning when the patterns were then explained by an expert during a lecture. One group was required to summarise information and the other was involved in the active data recognition task consisting of contrasting cases. Then both groups attended a lecture that linked experiment findings to theory on memory. All students were then given a new memory task that they had to make predictions about. The students in the active data recognition group were significantly better at making correct predictions than the summarising group. They also had a third group where students were exposed to the active contrasting cases data recognition task twice instead of attending the lecture from the expert. This group did poorly when compared to the group who attended the lecture following the task that required them to analyse the contrasting case data.

The PFL perspective on transfer provides new ways to evaluate the efficacy of particular teaching approaches, particularly in terms of how they facilitate future preparedness for subsequent learning experiences. This view of extended learning provides new methodology to measure learning gains that traditional methods of determining efficacy are not adequately sensitive to capture. In a context of a continuously changing world, determining the manner in which learning activities facilitate future learning may be more important than examining the learning of specific content (Bransford & Schwartz, 1999).

2.5.4 Transfer and Sociocultural Perspectives on Learning

There has been a tendency for sociocultural and situated perspectives to be interpreted as saying that transfer cannot happen because learning is contextually bound. This is a misunderstanding of the philosophy of these approaches. On the issue of abstraction, proponents of situated learning and sociocultural approaches are not in opposition to abstraction per se. In situated learning perspectives they describe the concept of cognitive apprenticeship which requires the internalisation of knowledge learnt in practice. What they find unacceptable is the presentation of learning situations where the information is too far removed from the practice that they are embedded in (Brown & Duguid, 1993). To illustrate their perspective
Brown and Duguid (1993) give the analogy between fables and morals. Fables provide an illustration of a way to behave presented within a particular case, whereas morals are an abstraction from cases. When students are presented with a fable they are able to apply the embodied morals to similar situations they encounter because the morals are grounded in situations. They suggest that much of the contemporary teaching is abstracted in a way similar to morals and not grounded in situations. They propose that the problem for students regarding transfer is that they are not given models of situations in which it is appropriate to apply their knowledge. In other words students have difficulty grounding their abstractions because to be effective learning must be contextualised. Their focus on describing this type of authentic learning situation is a reaction to teaching practices which isolate theory from practice.

However, the nature of transfer and learning in situated learning and sociocultural approaches when students are presented with authentic learning activities has been less clearly developed in the literature. Understanding the nature of transfer in these sociocultural approaches requires a re-conceptualisation of what transfer is and the relationship between the learner, their knowledge and the settings in which that knowledge occurs (Putnam & Borko, 2000). Even if there is acceptance that learning is context bound, something has to transfer between old and new situations (Sfard, 1998). If this was not the case, there would be no experts, pattern recognition, or professional artistry, and patient-centred practice would be virtually impossible. The contemporary notion of transfer as ‘preparedness for future learning’ (Bransford & Schwartz, 1999) may be more compatible with sociocultural perspectives than traditional notions of transfer. This view of transfer fits well with Broudy’s (1977) concept of knowledge as ‘knowing with’ as the ability to apply knowledge derived from the context of previous experiences to presenting problems in a new context. Transfer in these approaches can be viewed as evidence that learning from previous contexts facilitates a greater ability to participate in activities, rather than whether or not an individual can complete individual tasks in a new context.

Taking a view of transfer that is compatible with social learning perspectives can provide greater insight into conceptualising the development of professional craft knowledge, in particular the ability to deliver clinical services within a framework of patient-centred care. In a clinical setting using this approach, the successful transfer of skills may relate to the individual’s perception of the commensurability of the skills in both settings (Best & Edwards, 2001), even if they cannot completely apply these skills to the new situation without first seeking additional support or information.

There has been significant conflict in the literature between proponents of the constructivist and sociocultural theories of learning, with each perspective trying to prove that
the other theory’s view on transfer is incorrect. Much of the tension between cognitive and sociocultural theories of learning stems from their different philosophies of learning which reflects in their units of analysis (Greeno, 1997). Both sides address different questions in their research, but claim that their research is evidence of the inadequacy of the other approach. In discussing assumptions of situated approaches to learning, constructivist proponents Anderson, Reder and Simon (1996, p. 6) discuss their proposition that, in situated cognition approaches: “action is grounded in the concrete situation that it occurs”. Greeno (1997) concurs that such a statement would be considered true by proponents of situated approaches, however, he suggests that the evidence presented to disprove this proposition by illustrating occasions where transfer occurs and where it does not, does not adequately account for the fundamental differences in analysis between cognitive and situated theories of learning. He suggests that cognitive approaches emphasise knowledge development and contexts in which that knowledge is applied (performance). If knowledge can successfully be applied to different contexts this is seen as evidence that knowledge is transferable, and hence assumptions of the situated nature of knowledge are considered to be false. Having said this, it is important to recognise that Anderson and colleagues (1996) did not make the claim that transfer is an all or nothing phenomenon. Their investigation instead revealed that some types of knowledge appear to transfer between contexts more readily than others. From a situated or sociocultural perspective, the issue of transfer is not about whether or how knowledge is bound to the context but rather about the nature of the activity that the learner is engaged in, the situations when such activity naturally occurs and developing an understanding of whether any parts of these practices were learnt from participating in different situations. As Greeno (1997) suggests, the contention between these two approaches is a result of differences in their perceived units of analysis. From a cognitive perspective, analysis of transfer relates to the individual and their ability to construct, modify and apply knowledge through schemas to presenting situations. In contrast, from a sociocultural perspective the units of analysis are concerned with participation and interaction between the individual, other members of the community and the resources available within the community. The concept of transfer in situated perspectives addresses the ability to participate successfully across a range of situations over time (Greeno, 1997). Therefore general learning can still be considered to be consistent with situated approaches. Situated approaches suggest that it is the specific situations and the participants that influence the type of resources that individuals employ to complete activities or solve problems, so it is necessary to extend the analysis beyond the individual to the interaction amongst these things.

Many views of transfer, have a very individual focus on the process of transfer, as illustrated in the above case. Successful transfer is dependent on the individual recognising common elements between previously experienced situations and a new situation which allows
them to apply previous knowledge or experience in some form to the new situation. When emphasis is placed on understanding how transfer occurs in individuals, the degree that socialisation plays a part in the success or failure to apply previously acquired knowledge to new situations is rarely given adequate appreciation (Pea, 1987). Transfer is not just about the individual but is also a cultural problem. It involves the individual obtaining knowledge from society and then successfully applying it, but it also involves society successfully imparting knowledge to the individual in a way that makes it easy to apply. Learning and transfer can be seen as a continuous cycle that evolves with both changes in the individual and the social context (Beach, 1999). Whether or not an individual applies particular types of knowledge to a new problem may not just reflect their underlying knowledge, but rather their ‘situation reading’ – how they perceive the situation, which then guides them in selecting which process they should apply to a presenting problem (Pea, 1987). The context of the problem, including the expectations of the formality of the response, may influence the individual’s use of everyday or more formal knowledge structures. Selective knowledge transfer is required to enable the knowledge that has the best fit with the presenting problem to be efficiently utilised. Selection of techniques by the individual, and the individual’s motivation to persevere with solving the problem, are not only influenced by the context and the formality of the expected response, but are also socially mediated by cultural, historical and attitudinal responses of the community towards the type of presenting problem. Therefore ‘appropriate’ transfer is socially mediated and not simply an internal process occurring within an individual. Pea (1987) concludes that educational emphasis needs to be placed on explicitly bridging educational environments and making sure opportunities for students to transfer knowledge to different contexts are highly salient.

When transfer does not occur it can also be explained by two other factors: either the transfer is not considered to be appropriate which is usually socially and culturally defined, or alternatively the transfer of knowledge is considered too cognitively effortful for the potential gains of applying it to solve the presenting problem. These potential gains are usually socially mediated by the value system within specific communities (Pea, 1987). For example, sometimes it may be cognitively more economical to adapt a parallel system for formal school and everyday interactions because the cognitive effort required to integrate these sources of knowledge may be considered too great because of the degree of difference in the way these sources of information are presented.

There is also evidence to suggest that the nature of transfer evolves with experience. For example, Hatano and Inagaki (1992) examined how knowledge can become de-situated through the development of expertise. They argued that, for the novice, knowledge is highly
situated in the task, materials provided, and on the instruction of experienced people around them because they have not yet developed conceptual knowledge about the task, and therefore success is highly dependent on the support of external sources. As experience increases, there is a greater ability to use acquired knowledge and mental representations of tasks. However, such representations are highly dependent on the procedural aspects of tasks, and often lack the flexibility to adapt to changes to the set procedure, even when these are relatively minor. More advanced and powerful progress occurs when conceptual knowledge develops beyond the procedural aspects of tasks so that the nature of objects is understood as well as the procedures. This knowledge allows the formation of mental models which also enables the individual to run mental simulations. The understanding of each stage in the procedure and its purpose provides the opportunity for greater cognitive flexibility to make predictions, and consequently problem-solve adaptations to procedures when necessary. Hatano and Inagaki (1992) distinguish between two types of experts within domains: routine experts and adaptive experts. Routine experts are characterised by their efficiency in applying set procedures, but they lack the flexibility to transfer their acquired knowledge to other contexts. In contrast adaptive experts are capable of applying knowledge to different contexts because of their greater depth of knowledge characterised by mental models. Their knowledge is situated in the history of previous experiences, but the mental models allow a greater level of de-situation between new experiences because experts are dependent on internal rather than external levels of support. This is reflected in the skills of professional artistry which clinicians now need to be proficient in providing client-centred care – a highly adapted use of procedural and conceptual knowledge.

Hatano and Inagaki (1992) propose that there are two prerequisites for the creation of mental models: observations of the capabilities and attributes of the target object; and what they refer to as existing ‘source’ models that can be adapted or transferred to some extent to the new model. They propose that selection of an appropriate existing model to adapt occurs through abduction which they describe as a process of “constructing a hypothesis to explain a set of puzzling facts.” (Hatano & Inagaki, 1992, p. 123). However, they report that this process is virtually impossible if an individual does not already possess an existing mental model which has enough similarities to the new knowledge to allow some generalisation of key features.

### 2.6 Educational Implications of an Integrated Approach

An acknowledgement that learning occurs through both constructivist and sociocultural mechanisms of learning requires reflection on current educational practices. In particular, the importance of socialisation and increasing the exposure of students to authentic learning opportunities creates new challenges for educators. Applying authentic learning in education settings is acknowledged to be difficult, particularly in the school setting (Brown,
Although they concede that it is impossible for students to be placed in authentic workshops, they suggest that it is possible to demonstrate and engage students in authentic practice within the classroom. They see the way forward as having teachers reflect on and engage students in authentic behaviour. They concede that such an approach in the classroom will always require a degree of compromise in terms of the level of authenticity that can be achieved. However, they claim that currently there is excessive compromise in traditional classrooms.

One of the dilemmas in the school environment is that the skills targeted in school are often generalised (Griffin, 1995). In contrast, learning out of school environments is often context specific. In the case of vocational education, the dilemma is not as pronounced because there is a domain specific goal in terms of knowledge acquisition. There is, however, a range of learning experiences within the curriculum of these courses that vary in their level of authenticity. In the following section different learning experiences within the learning environment are explored in relation to their level of authenticity. Just as context is argued to mediate the relative dominance of the individual and sociocultural learning loops in the proposed educational framework, the level of authenticity also guides educators in the choice of instructional techniques.

2.6.1 The Continuum of Authenticity and Instructional Design

In the integrated educational framework discussed at the beginning of this chapter, a model that required acceptance that both constructivist and sociocultural models of learning coexist to facilitate the development of professional artistry was proposed. This proposition requires a conceptual shift to consider the elements of both theories to be on a continuum rather than in conflict. In the proposed educational framework it was argued that the context of the learning situation was the moderator of the relative dominance of the constructivist or sociocultural learning loop. In this section this argument is extended to propose that the degree of authenticity of learning experiences will also determine the relative dominance of a particular instructional approach to learning. Just as the level of authenticity in learning activities influences the relative dominance of each learning loop, it also guides educators in the best choice of instructional techniques to facilitate student learning. In clinical education, there are a range of learning experiences that students are exposed to, and within this range there are varying levels of congruence between the learning experiences of students and the manner in which they are expected to apply this knowledge in clinical practice. The distance between the learning experience of the students and the manner in which they will ultimately apply their learning can be considered as a continuum of authenticity. This continuum describes the degree to which the context of learning reflects the real life learning circumstances in which the new
knowledge is intended to be applied. At either end of the continuum are classroom based activities within a framework of instructional design and immersion in authentic clinical practice (Figure 12). In the middle of the authenticity continuum a hybrid approach that incorporates principles of instructional design situated within authentic activities is proposed.

![Figure 12: The authenticity continuum and instructional design](image)

Traditionally, instructional design techniques are more closely aligned to constructivist approaches to learning that emphasise the development of the individual’s learning. These approaches suggest that context can facilitate learning but it is not essential that this is a real life authentic context. Sequentially programming instruction to take into account the students’ prior learning and the specific curriculum goals are considered essential for planning instruction. Merrill (2002) examined commonalities between theories of instructional design and summarised five core common principles of these approaches. He describes these as relationships that remain true under the correct conditions regardless of the instructional activity and approach. Not all are present in each instructional approach, however, they provide useful guidance in the design and implementation of instructional design approaches. Merrill’s (2002, pp. 44-45) first principles are:

- Learning is promoted when learners are engaged in solving real-world problems.
- Learning is promoted when existing knowledge is activated as a foundation for new knowledge.
- Learning is promoted when new knowledge is demonstrated to the learner.
- Learning is promoted when new knowledge is applied by the learner.
- Learning is promoted when new knowledge is integrated into the learner’s world.

At the opposite end of the spectrum, sociocultural approaches to learning advocate immersion and increasing levels of participation in core activities of the community of practice as the goals. Learning is considered to be highly context bound to the specific authentic learning activities. An example of a learning experience with a high level of instructional design is a lecture where students are expected to learn through listening to a lecturer and incorporate the newly presented information into their existing knowledge of the subject. An example of an activity incorporating instructional design and authentic activities would be where students are presented with a clinical case in a tutorial and are asked to take the role of a speech pathologist and plan intervention for the client. Finally being on clinical placement and having the
opportunity to observe or directly participate in clinical practice represents an example of engagement in authentic activities.

From a sociocultural perspective, the actual participation is of paramount importance, so the focus of educators is on developing the type of social engagements that allow increasing participation in the core activities of the community of practice (Cobb, 1994). One of the very attractive features of sociocultural perspectives for the study of the development of professional artistry is the close link between knowing and doing (Wineberg, 1989). From a constructivist approach, the quality of the individual’s development of knowledge through interaction in the classroom is of greatest importance. The focus is not on the the broader community but rather on how interactions between the student, teacher, and peers assist the student to construct and modify their existing knowledge.

On the surface these educational approaches seem to be incompatible. However, just like the complementary ways in which constructivist and sociocultural theories of learning provide strengths to the opposing theories’ weaknesses, these two instructional approaches can also be complementary. When instructional design approaches are employed without regard for the level of authenticity of the activity, there is a risk that learners will not fully appreciate the applications of their learning in the real world. Conversely, simply engaging in authentic activities without some overall instructional direction runs the risk of learners developing uneven learning profiles related to their relative exposure to activities within the community of practice.

Brown and Deguid (1996) argue that students must ‘steal’ knowledge because, in authentic situations, much of the knowledge is implicit rather than explicit. Situated cognition approaches emphasise that the implicit nature of many aspects of professional practice is a key reason for learning to be situated. Whilst some features may be made explicit, these should always be related closely to the context they have been abstracted from, otherwise they lose their relevance. The difficulty for educators with this approach is that students must meet a very explicit level of performance on a variety of competencies in order to graduate. Without some components of instructional design it is very difficult for educators to ensure that students are exposed to, develop and display competency in an adequate range of learning experiences. There is a moderate view amongst educators that an optimal learning framework in education may lie somewhere between these two extremes. There is a suggestion that instructional design principles, when combined with authentic learning activities, can enhance learning. From the point of view of the proposed educational framework, such approaches may represent the optimal instructional approach in classroom-based subjects as it is likely to simultaneously activate both individual and sociocultural mechanisms of learning, and ensure students are
exposed to the required curriculum whilst also ensuring students have a strong sense of the
relationship of learning objectives to clinical practice. Implementation of this view of optimal
learning experiences requires flexibility and compromise from both instructional and authentic
learning approaches. Proponents of instructional design approaches must accept the need to use
authentic activities wherever possible to facilitate learning and acknowledge that learning in
context is an important consideration in programming. Proponents of sociocultural approaches
must recognise that it is possible to incorporate principles of instructional design into authentic
situated learning activities without compromising the integrity of the learning experiences. This
is a particularly important framework to consider when incorporating authentic activities into
the classroom.

Putnam and Borko (2000) highlight that while the focus of much of the debate on the
best ways to facilitate learning has centred on the curriculum implications for school students, it
also has considerable implications for the development and education of tertiary students. In
their research, they focus on the implications of sociocultural approaches for teachers in the
workforce and also preservice teachers. Whilst much of their article deals with the dilemmas of
how to teach teachers to incorporate sociocultural approaches into their teaching practice, they
are also concerned about how to take advantage of situated and sociocultural approaches in
facilitating the education of preservice teachers.

Many of the dilemmas they raise in the education of preservice teachers are similar
to the dilemmas faced by educators of health science students. In particular, they are concerned
with how to make learning experiences both in and out of the classroom sufficiently powerful to
enhance learning. They reject interpretations of situated learning which advocate that all
learning should occur when student teachers are teaching in the classroom (the authentic
teaching learning environment). Rather they argue that every learning setting has a context and
what is important is to understand how different settings influence learning so that learning
experiences can be more optimally matched to the most conducive learning contexts. They
suggest that situating some experiences outside the classroom may actually allow for more
powerful learning. Furthermore, they point out that it is not possible from a resource perspective
to provide all learning experiences in the classroom because the demands of providing one-on-
one support for all learning is impossible. In their review of learning of teachers, they propose
that in some cases learning new information outside the classroom is initially more facilitative
because the strong existing culture in the classroom makes it hard to move away from current
well established teaching practices. It also allows the freedom to explore and experiment with
new ideas whilst not simultaneously having to deal with the ongoing challenges of a classroom.
Therefore workshops may present powerful learning opportunities to learn new skills away
from the additional challenges of the teaching context. Once teachers are more familiar with the
skills, the context of the classroom may provide the most facilitative environment for
discovering how to put new ideas into practice. This works well for teachers who have their
classroom context to make this transition but it provides a challenge for preservice teachers and
their educators to provide adequate contexts to support the application of new knowledge to
teaching practice. Therefore the importance of carefully combining classroom and practice
based experiences to maximise the facilitation of learning becomes important. Their suggested
solution is to advocate case-based teaching opportunities. They suggest case-based learning may
allow greater opportunities for novice students to have the luxury of time and repeated exposure
to reflect on practice and think critically. Sometimes the overwhelming nature of having to act
immediately in the classroom can be a barrier to learning when students are actively engaged in
practice. The same could be said for health science students in a clinical setting.

Case studies have the added advantage of being easier to control and design for
educators, and are complementary to other curricular learning occurring at the same point in
time. The advances in media and technology are also providing opportunities to develop rich
learning cases that have the potential to be evolving rather than static which more closely aligns
them with real life practice. Research is needed to develop a greater understanding of the
contexts that work best for different types of learning (Putnam & Borko, 2000). For example,
when should real life complexity be included in cases and under what circumstances should
situations be simplified to allow a more specific focus on a key element of learning?

Putnam and Borko (2000) also suggest that tertiary learning needs to shift from
seeing its role as developing individual knowledge and competencies to recognising learning as
the development of discourse communities for students. Learning activities that have a lower
level of authenticity in relation to the community of practice that the students are entering into
(for example: foundation subjects undertaken in another discipline) have to rely on more
instructionally based cognitive approaches to learning because students are not being socialised
in authentic activities for their community of practice. It is hypothesised that these areas of
content will be the most challenging for students to cognitively organise their learning because
they are not being given explicit instruction on how to apply this knowledge in their specific
community of practice. There is a greater level of transfer and cognitive reorganisation required
for this knowledge to be applied to activities within the student’s specific community of
practice. The need for integration of course components to ensure knowledge does not become
fragmentary has been well recognised. The importance of this is highlighted in attempts to
address these issues through the restructuring of courses to ensure a greater level of coordination
between experiences in laboratories, in the classroom and on clinical placements (Pickering,
Rassi, Hagler, & McFarlane, 1992). What is being suggested here is that information taught in subjects with lower levels of authenticity may require more explicit instruction on how this information relates to and is important for understanding and participating in authentic practices within the student’s own community of practice. Any assumption that this knowledge will naturally transfer without this may be erroneous. These challenges may be broader than just the degree of cognitive reorganisation required. As already discussed the value placed in committing the cognitive effort required to assimilate new knowledge is also highly socially driven by the perceived importance within the community of practice. Without an understanding of why this knowledge is important within their community of practice, students may not perceive the value of investing the cognitive effort, and therefore employ shallow learning processes aimed at passing assessment processes, rather than developing a deep understanding of course content and how it relates to clinical practice.

Even when classroom-based authentic activities are utilised, clinical practice provides the only environment in which students can be exposed to the complete contextual clues which need to be understood to apply clinical practice quickly and effectively to a given clinical situation (Cope, Cuthbertson, & Stoddart, 2000). Bromme and Tillema (1995, p. 266) suggest that “Becoming a professional is not a process of substituting theory by experience, but a process of fusing theory and experience.” Discussion of how best to help students integrate theory and practice is still an area of considerable contention. There are some schools of thought that place the blame on the nature of the theories, claiming that the difficulty is that current theories are not adequate to describe practice and that creating improved theories would improve the ecological validity of theories and therefore allow their direct application to practice, making the task easier for students and clinicians. However, the nature of theories is that they are abstractions based on research findings. They promote general principles and are not intended to be applied to specific cases without some degree of modification (Bromme & Tillema, 1995). As Broomme and Tillema (1995) suggest, it is only through transformation that these theories become practical knowledge and it is the challenge of educators to determine how best to facilitate these transformations to foster students’ abilities to develop professional artistry. They suggest that much of this transformation is socially and culturally driven through immersion in the work context which, in this case, is through participation in clinical practice.

Educators need to persuade novice students that it is essential to adapt and transform rather than abandon formal, generalised knowledge gained in classroom settings so that they can adequately adapt it to develop craft knowledge (Spouse, 2001). It is crucial to this process that novice students learn to recognise the relevance of their existing theoretical knowledge to the clinical situations they encounter. Spouse (2001) contends that sociocultural models provide a
good framework through scaffolding, mentoring and legitimate peripheral participation to guide
the development of students on clinical placements. When educating students she contends that
there is a dilemma where students have theoretical knowledge but do not know how to apply it
to clinical practice. Conversely, experienced clinicians have well developed clinical knowledge
but, because of its tacit nature, they do not always have the theoretical knowledge or vocabulary
to describe it. She suggests that considerable thought and energy must be invested by both the
student and the mentor to ensure a mutually beneficial learning environment develops.
Therefore there also needs to be recognition that learning is a two way process in which
students also contribute to the knowledge of the profession (Abrandt Dahlgren, Richardson, &
Kalman, 2004).

There are several processes which students must go through to gain acceptance into a
community of practice whilst on placement. Cope and colleagues (2000) suggest that, at a
preliminary level, students must gain social acceptance which is separate from needing to meet
levels of competency. Following this, students must achieve professional acceptance within a
professional community by demonstrating adequate familiarity with the context of placement
and displaying an adequate level of confidence in abilities that fosters acceptance by other
professionals within the community. For nursing students a cyclic model was described where
knowledge of theory from their academic courses was situated in nursing practice and this
situation of knowledge then prompted students to reconceptualise their original knowledge
(Cope, Cuthbertson, & Stoddart, 2000). Cope and colleagues (2000) considered that cognitive
apprenticeship with more experienced community members greatly facilitated the development
and transformation of students’ clinical knowledge.

Recognising the continuum of academic and clinical subjects is also important in
facilitating the development of students to become patient educators. Monstrom and Shepard
(1999) discuss the challenges in facilitating students to make the transition from therapist-
centred to patient-centred thinking when facilitating patient education. They suggest that
learning about patient education takes place in both academic and clinical settings, and that
clinical educators have a vital role to play in facilitating links between academic and clinic-
based learning. They consider that one of the biggest challenges is making students realise that
establishing therapeutic relationships with clients is not just common sense, but requires a high
level of clinical judgement and an appreciation and willingness to implement a variety of
pedagogical approaches tailored to the specific situation. This raises a dilemma for classroom
approaches because they cannot replicate the subtle situational variances that fine tune real life
clinical practice. The challenges associated with developing authentic learning experiences are
discussed further below.
2.6.2 Challenges to Implementing Authentic Learning Experiences

A considerable proportion of the literature addressing the challenges associated with the implementation of authentic learning experiences has focused on the perspective of implementing these approaches within the school classroom. Many of the challenges in this setting relate to the mismatch of goals in school when compared to other learning contexts. Part of this conflict arises from tensions concerning the normative view of school standards of attainment and the frequent mismatch of these with the practices of communities outside the school environment (Lagache, 1993). Resnick (1987) describes three broad areas where the goals of school learning may differ from learning in other contexts. These differences underlie many of the barriers that educators face when attempting to implement authentic learning in school-based settings. Firstly, in the school setting, learning and performance predominantly centres on the individual. In other settings such as in the workforce, knowledge and performance tend to be collectively shared. Secondly, in the school setting there is a tendency for pure thought tasks that emphasise what the individual can achieve independently (often from memory) rather than an emphasis on what an individual can achieve when provided with appropriate tools to assist performance. The final striking contrast between school learning and other contexts concerns the emphasis in school on symbol manipulation while in other contexts it is contextualised reasoning using the objects and other cues available in the environment which often produces the fastest and most applicable solution. Although tertiary education of health professionals is a more direct educational application of skills learned, many of these challenges persist even though they are present to a lesser extent than in school settings.

When discussing the difficulties of developing an appropriate mathematics curriculum for school students, Lave (1992) acknowledges that the solution cannot be to send children out into the everyday world to learn mathematics. She also acknowledges that the classroom is itself a real learning scenario of mathematics in school. She also contends that there can be a paradox between the goals of everyday life and the goals of mathematics calculations. For example, in real life problem solvers want to find the easiest, most efficient solution to problems. When discussing mathematical word problems in the school environment, she suggests that the type of calculations required are likely to meet a differing goal of understanding mathematical operations, and despite attempts to make problems more realistic on the surface, the underlying goals and operations are likely to remain inherently different. She gives the example of bringing a lawn mowing business into classroom practice to solve more realistic mathematics problems. However, despite the intentions to create a more authentic approach to mathematics, by applying this type of problem in the classroom the teacher may inadvertently create a new practice that is real in neither a lawn mowing practice nor in a school practice. Lave questions whether reality or realism should be seen as the bridge. She argues that
imaginary practices can be equally viable as real life practices. For Lave the key is that the problems presented to students reflect the opportunity to engage in real life dilemmas rather than hypothetical puzzles. The key to authenticity in Lave’s (1992) opinion is the nature of the dilemma rather than whether the actual scenario is real or imaginary.

Ball (1993) identifies three areas that are particularly challenging when attempting to implement authentic learning in the primary school classroom. She describes them as the dilemmas of content, discourse and community. She discusses the challenges of trying to bring mathematics practice into the classroom in a way that is authentic but still accessible to the learning capabilities of 9 year old students. Another challenge to school teachers is the range and number of topics required to be covered in the school curriculum compared to the task of mathematicians who commonly devote considerable amounts of time to solving a few discrete problems. Educators of adults do not have same degree of difficulty in terms of moderating content from a cognitive level for young students, however, there are still dilemmas of how to allow authentic problem solving but not overwhelm students with case complexity and how to cover the vast array of information that undergraduates must learn and demonstrate competency in by graduation. Drawing further on Lave’s (1992) argument, the difference between the goals of classroom based learning and practice-based training can be a source of conflict. School based learning aims to develop “general academic competencies” such as general declarative knowledge, whereas practice based learning involves the development of “specific cognitive skills” which enable task performance through greater approximations of core elements of practice (Gott, 1988-89, p. 97). In courses preparing students for practice, the ultimate goal for students is to practice effectively in a vocational context, so many of the dilemmas faced in school-based environments with respect to the mismatch between learning goals in the classroom and the authentic environment are not as great an issue of concern. However, foundation skills subjects can be likened more to generalist school subjects and there is a need to develop ways to help students transform this generalist knowledge into more authentic domain specific knowledge bases. In addition, educators need to recognise that there is a transition from the university based setting which predominantly emphasises the education of the individual to the more socially and collaboratively orientated context of clinical practice (Jaye & Egan, 2006). Jaye and Egan (2006) also emphasise the challenge for students of reconciling the ideal presented within universities and the reality of practice that they are exposed to on clinical practice. Discourse as well as content needs to be considered when developing authentic learning environments.

When greater emphasis is placed on the development of situated learning or authentic learning environments there has been criticism that learning tasks can take on an
almost Disneyland quality where there is so much emphasis on engaging students that the underlying curriculum goals risk becoming lost. However, whilst not all learning activities have to be enjoyable, there is evidence to suggest that working on topics or materials that are interesting to students facilitates deeper cognitive processing, greater understanding, increased use of imagery, and broader more emotionally aroused learning associations (Tobius, 1994). Students, and particularly adult students, work harder and learn more when engaged in activities or tasks that interest them. Tasks need to be balanced between engagement and learning goals to ensure motivation and learning needs are adequately met. Tobius (1994) makes the distinction between situational interest and topic interest. Situational interest refers to those elements directly relevant to the presenting situation that arouse interest in an individual. These factors can include the intensity or novelty of a situation, or specific factors relating to the situation that trigger interest in the individual. This type of interest is likely to be highly context dependent. Topic or individual interest is a much more constant form of interest which has a tendency to be relatively stable regardless of the context. This type of interest reflects the preferences of the individual for types of activities, tasks and contexts. Both of these types of interest can have a considerable impact of the individual’s motivation and application to learning when presented with particular activities and contexts. When learners are confronted with a new area of learning, it is often the situational interest evoked by the tasks and contexts of learning that will determine whether the individual makes the cognitive effort to develop knowledge further into a topic interest (Tobius, 1994).

Another difficulty of learning and transfer in teacher education that is also applicable to health science students is referred to as the relevancy problem (Korthagen & Kessels, 1999). In real life practice, beginning practitioners need to be able to make instantaneous decisions, often when presented with conflicting data. In this survival mode it is very easy for practitioners to take a very action orientated approach to develop quick concrete solutions rather than drawing more deeply on their theory-based ‘expert’ knowledge which is often formally conveyed to students during their teacher education. Korthagen and Kessels (1999) suggest that this is probably the biggest contributing factor to difficulties integrating and transferring theoretical knowledge for early teachers. A similar situation is likely to occur for beginning practitioners in fields other than teaching. As a means of combating this there has been an emphasis on incorporating reflective teaching into the curriculum so that new practitioners are given the opportunity to take time to reflect on their practice through guidance of experts.
2.6.3 Developing Optimal Learning Environments

There has been limited research to support and guide educators in the implementation of more authentic situated learning experiences. The final section of this chapter outlines examples of how educators have combined principles of instructional design with situated cognition to facilitate more authentic student learning in the classroom and on clinical placements. Examples are drawn from a variety of disciplines to illustrate the range of settings and educational challenges which may be adapted to this educational approach.

Several educators in health sciences and medicine have embraced the potential of situated learning approaches to enhance student learning. Although the theory-practice dichotomy is inaccurate given it is impossible to separate the two (Higgs, Andresen, & Fish, 2004), one of the big challenges for students who have been taught knowledge in formal academic settings is developing the ability to transform and present it in a manner that is likely to facilitate change in patients. Many students fall into the trap of being able to reproduce information obtained in academic settings and present it in a highly cognitive manner which is frequently not accessible to patients (Monstrom & Shepard, 1999). Monstrom and Sheppard (1999) suggest that the best way to teach students to facilitate patient learning in a classroom environment is to model authentic patient educational practice when conveying information to students. They give the example of a back pain unit being taught in the classroom to physiotherapy students. As well as looking at aetiology and therapeutic techniques, students received specific modelling and instruction on how to educate patients. Similar focus can be embodied in exam situations, with questions asking about how and what feedback could be given to patients to assist their rehabilitation and/or prevent further injury. They suggest that socialisation of students as teachers increases the receptiveness of students to recognise their role as patient educators as an essential component of their clinical practice. Students need an understanding and appreciation of both the individual characteristics of a patient (for example, past experience, age, motivation, learning abilities, physical and mental health, language and cultural background) and the nature and goals of the setting (for example, acute, rehabilitation, community based, home based) to formulate the optimal strategies to facilitate therapeutic relationships with patients. Monstrom and Sheppard (1999) use student reflective journals to help students learn from and reflect on the complexities of authentic patient-centred practice. Typically it is the situational specific nature of practice that may conflict with student belief systems of commonly accepted social norms which appear to cause the most dilemmas for the students. They give the examples of having to shout at a person who is very hard of hearing, the dilemma of when to call an older person by their first name, adapting to the need to push clients
to make rapid progress in acute settings, and adapting to different cultural requirements in relation to religion and the gender of clinicians and patients.

In medicine the need for a re-evaluation of teaching methods in the classroom has been recognised with a shift from lecture based learning to learning in small groups. Traditional medical curriculums have been criticised for being too lecture focused, with a reliance on teaching factual knowledge through a passive approach rather than creating small group learning activities which allow students to engage with materials in a manner which more closely reflects clinical practice. Passive teaching also limits the opportunities to allow students to engage in self-directed learning – an essential skill for the promotion of lifelong learning. This is critical given the vast array of knowledge (well beyond what can physically be taught within the timeframe of a degree) and the rate at which such knowledge is changing (Winter, Wolf, Nutter & Beaty, 1997). Small groups also provide a better forum for teaching essential clinical skills such as communication skills and physical examination skills. Jones and Young (2006) discuss the importance of socialisation as part of the learning process for medical students. In particular they highlight the multidisciplinary nature of working in a team of health professionals in clinical practice and the need to provide learning opportunities for students which replicate the collaborative nature of clinical practice. In their course they utilise a problem-based learning approach to facilitate a collaborative approach to learning which encourages a greater degree of hypothetico-deductive reasoning than occurs with more traditional learning scenarios. This approach allowed them to strengthen links between subject matter taught in a more traditional way with specific clinical practice. To illustrate this, they give the example of anatomy subjects which are traditionally taught in a manner which encourages rote learning for the purpose of passing an exam. To provide greater links with this subject matter and the relevancy to clinical practice, they incorporated a problem-of-the-week that contextualised or situated the anatomy taught during the week in a specific clinical case. Another problem-based learning approach to facilitate knowledge transfer from the classroom and the clinic involves looking at the curriculum from a different perspective. Rather than incorporating problems into an existing curriculum, important problems faced by students in practice influence the way in which learning and the curriculum are structured. Teachers draw on their knowledge and experience to select tasks related to students’ presented clinical dilemmas that will challenge students whilst taking into consideration the previous level of knowledge of students and the likelihood that the students will be able to connect the new problem with their existing knowledge. There are some concerns that this approach can cause important sources of information to be omitted because there is a higher degree of unpredictability of content covered when such an approach is employed (Hiebert, et al., 1996). Hiebert and colleagues (1996) suggest that it is not only the task that is important, but also the
culture of the classroom in which students engage with the presenting problem. Students must actively engage in the task and share and justify their methods and results as well as taking full advantage of the opportunities to learn from actively listening to different perspectives and solutions from fellow students. Opportunities to engage in the learning process allow students to have greater possibilities to structure new knowledge both in terms of developing new methodologies to solve presenting problems and more general problem-solving plans of attack.

Barab and Landa (1997) also discuss how the dilemmas of learning in the real world may differ from learning in the classroom. Outside the classroom individuals learn skills and concepts as tools to solve problems, whereas, inside the classroom, emphasis is placed on the recall of information. Information is also presented holistically rather than in discipline specific subjects. In response to this, efforts have been made to look at ways that these learning processes can be replicated in the classroom. One method that has been proposed is the use of problem-centred interdisciplinary units. In these units, learning spans several disciplines, and students learn to draw on knowledge from a range of disciplines to solve a presenting problem. Whilst there are many advantages of these types of learning units such as catering for a broader range of learning styles and engaging students in meaningful problem-solving, one disadvantage is that planning and organising these units is time consuming compared with traditional teaching approaches. In tertiary education there have been several examples where a shifting of emphasis to situating knowledge has resulted in a restructuring of curriculum design. In an attempt to immerse students in an integrated curriculum, Galligan (2004) described the planning and implementation phases of a tertiary preparation program for non-English speaking background international students. This program was developed based on a situated cognition and theories of transfer approach to attempt to facilitate students’ ability to apply mathematical skills to their academic study. This was achieved by integrating the mathematics content into the other streams of the preparation program such as using mathematics vocabulary in vocabulary and grammar classes, presentations, and incorporating mathematics into reading comprehension tasks. Assignments were marked with the dual purpose of demonstrating academic competency in English skills and competency in subject areas such as mathematics. The educators proposed that the incorporation of academic numeracy skills across a range of topics with a variety of instructors highlighted to students the importance and academic value placed on numeracy skills. It also highlighted that the manner that these skills are applied at university differs from the typical types of instruction that students have previously been exposed to at school. Integration of subject areas also made the ways that skills could transfer between subjects more salient to students.
In another tertiary education example, Sweeny and Paradis (2004) report on the challenges of preparing undergraduate science teachers to be competent at designing laboratory experiences (labs) for high school science. The undergraduates are taught teaching theory in university science laboratories but find it difficult to apply these teaching skills to adapt and redesign the content of university labs to a suitable level for high school students. Experience on teacher placements often allows them to learn how to teach the theory of science in the classroom but opportunities to design ‘hands on’ science labs on placement are often limited until final internships. The difficulty for these pre-service teachers is that their experience of science labs is as a student not as a teacher. Without experiencing the behind-the-scenes planning and problem-solving, they do not have the opportunity to successfully acquire the skills to design and implement these labs. They also develop limited understanding of the important practicalities of running laboratories such as safety, maintaining stock and safe disposal of chemicals.

In response to these difficulties the education and science faculties jointly developed a specific laboratory training course using situated cognition as a theoretical basis. The key premise was that, in order to develop skills in laboratory course design, students needed to learn those skills by actually completing that specific task rather than assuming spontaneous transfer and adoption of previously acquired knowledge. For fifteen weeks two students were given the opportunity to plan and teach science laboratories courses to lower level undergraduate students. Assistance with this task included specifically being instructed on how to use learning theories and pedagogical approaches within the laboratory course designs. They also attended specific instruction on how to manage the behind the scenes aspects of managing a laboratory course. Their study only involved two single case studies which limits the ability to draw conclusions until a larger scale study is completed. However, both students cited several benefits from being involved in the course including developing a deeper understanding of science content so they could teach it, learning how to run a laboratory course, and learning how to address different student learning styles. They were followed up again using a structured interview technique one year later once they had started full time high school teaching. The purpose of the follow-up was to determine whether the skills they learnt teaching undergraduate students were transferable to high school teaching. Both students indicated that they had transferred several techniques to their high school teaching including laboratory course design, designing quizzes and specific teaching techniques such as providing scaffolding to guide students to reach their own conclusions. This study highlights the value of providing students with specific real-life examples of professional practice whilst completing their undergraduate training. It also suggests that there needs to be greater discipline collaboration and joint course design to ensure
that students are given the opportunity to see the functional applications for theoretical knowledge within their specific professional domain.

Ziman (2003) also described a successful attempt to develop an authentic learning experience for teaching tertiary biomedical students about the pharmacology of social drugs. A real gap in research knowledge existed in relation to the pharmacology of these drugs so students were given a real task that contributed to the enhancement of knowledge in the bioscience community rather than simply learning a subject because they needed to acquire knowledge for their own learning. Students were divided into groups to research specific drugs and were asked to complete a literature review, make a presentation to peers and other community scientists, and then, based on feedback from these tasks, design a resource that would educate the general public. As well as having student learning goals, the task provided relevant information to both the workforce and the general public. Student feedback from involvement in this unit was very positive, although there was a trend for more able students to enjoy this type of less structured task based on self-directed inquiry whilst weaker students tended to prefer to be given information that more closely resembled to format of materials in assignments and examinations. When the quality of literature reviews of the students enrolled in this task were compared to the students in the previous year cohort who were given a more traditional didactic curriculum, students engaged in the authentic learning tasks performed significantly better than students in the previous year. Whilst Zieman (2003) acknowledged the limitations of drawing too much from a small study without a more robust control and outcome design, the findings do emphasise the potential for authentic learning environments to produce higher quality of learning due to more tangible outcomes and more salient links between teaching, learning and students’ future professional careers.

Powell (2000) examined situated cognition using a case-based approach to teacher education. Case-based pedagogy assists student teachers by providing the embedded contextual knowledge they need to make decisions in the classroom, however, teachers also bring case studies their own social and cultural beliefs linked to their previous life experience. He used dilemma case-based information to examine how contextual and cultural knowledge within the case and the individual experiences of the pre-service teachers influenced their decision making and critical thinking in response to the case study. He found that prior experience of students dominated their point of view in discussion and that this seemed to have greater bearing on their responses than theoretical considerations. For example, teachers drew on their own experiences as parents or students within the educational system to solve the dilemma in preference to their learnt academic theory.
The importance of situated learning is also reflected in the field of primary education. Griffin (1995) developed a quasi-experimental design framework which compared the ability of two fourth grade classes to develop map reading skills. One class was taught using a traditional classroom based presentation and the other was taught using a situated cognition framework (they physically followed their map routes in addition to the traditional learning about locations, landmarks and planning routes). At the conclusion of the teaching units, both groups’ performances were assessed in a written assessment and two performance tests. The written assessment closely mirrored the type of classroom tasks occurring in the traditional instruction classroom. The two performance tasks involved an authentic map reading skills task (navigating to a building using a location map) and a transfer performance task (a map navigation task involving reading a multi-storey building plan rather than a location map). Results revealed no significant difference in performance on the written task that used the traditional instructional methods, but the situated cognition group performed significantly better on the authentic map reading navigation task. There was also no significant difference in performance between the two groups on the performance transfer task. Griffin (1995) concluded that situated cognition appeared to be a more robust teaching method for map reading citing equal performance on the written assessment but superior performance on the map reading skills task. She proposed that the reason for the lack of transfer for the transfer map reading task could be attributed to the changes in context of map reading such as transferring from one dimensional to three dimensional information relating to the different floors of the building. She also suggested that another reason could be differences in motivational levels in students completing traditional versus the situated learning activities.

2.7 Summary

Following discussion in Chapter 1 of contemporary views of learning, expertise and practice, in this chapter a new perspective on the development of professional artistry is proposed which could better capture the complex multifaceted nature of the learning processes involved in becoming a professional. An integrated educational framework is proposed consisting of complementary coexisting constructivist and sociocultural learning loops which acknowledged the equal importance of individual and social learning processes. Central to this proposed educational framework was the concept that the relative dominance of these loops was mediated by the authenticity of the learning context. What is not well understood in the literature at this stage is how to design more effective learning contexts, how these learning contexts influence learning, and at what stages in student learning are certain learning contexts optimal for learning and development. Equally contentious is how learning is defined and measured particularly in relation to contemporary and traditional views on transfer.
This thesis aims to explore student learning across a series of learning contexts. The first stage of this research involves reflection on and subsequent development of a suitable learning task which could help to examine students’ learning across a range of learning contexts. One of the important contributions of the integrated educational framework is to draw educators’ attention to the importance of the context of learning. Although it is conceded that every learning situation has a context from the most abstract, theoretical didactic lecture to the most immersive clinical experience, this model challenges educators to reflect on how congruent the learning experiences of students are to the manner that they will ultimately apply this knowledge in clinical practice. Successful clinical practice requires the seamless intertwining of individual learning, identity and the highly socialised practices within the community. Therefore when planning educators need to reflect on the ability of students to make use of both these learning processes. With this in mind, the first stage of the research involves reflection on and subsequent development of a suitable authentic learning task which could help to examine student learning. Drawing on the educational applications discussed in the previous section, a framework which enabled the incorporation of instructional design principles into an authentic, situated case-based Online Learning Module (OLM) was proposed as the methodology of choice. The development of the OLM is discussed in Chapter 3.

Following the development of the OLM the research focus turns to examining how the context of the OLM could influence student learning. In designing the research, the aim was to explore some of the different contexts or learning scenarios outlined within the development of the integrated education framework. When describing learning experiences, one of the learning scenarios with a lower level of authenticity or contextual relevance for students concerns learning materials in subjects taught by other disciplines. In these subjects it has been argued that students are less able to use processes of socialisation to assist their learning because materials are being presented within the sociocultural practices of the other discipline. In other words, the links between the knowledge presented and the manner in which such knowledge is applied within the student’s community of practice is not explicit. This type of learning scenario within the educational framework has the greatest risk of inadequate student learning. Firstly, when links between course content and practice are not salient then the degree of knowledge transformation which must occur is much greater and therefore more difficult. Secondly, without an individual being able to perceive the relevancy of information to their past knowledge and experience and the lack of the motivation of the social value of mastering such information within the community of practice, students may employ surface learning strategies to pass the course rather than employ deep learning strategies to transform and integrate this knowledge into their existing knowledge base. The topic for the OLM was applying psychometric skills to the interpretation of standardised language tests. Psychology students
participated in this stage of the research. Understanding how to apply psychometrics to test interpretation is an important clinical skill for psychology students. However, in this case the learning activities all related to how to apply these principles within a speech pathology context. This stage of the research aims to examine how learning these skills within the context of another discipline influenced learning outcomes and is outlined in Chapter 6.

The next learning context to be examined concerns whether an OLM that embeds theoretical knowledge typically learnt in other disciplines in authentic clinical practice could help students to recognise the relevancy and also support them in transforming and applying this knowledge within their own community of practice. This learning context also provides an illustrative example of how learning materials could enhance the links between classroom based and clinic learning, even when instruction is occurring within students’ own academic discipline. To explore this, speech pathology students completed the same online learning module as the psychology students. Speech pathology students at the tertiary institution where students were recruited typically learn about psychometrics in the psychology discipline, whilst the study of language disorders and language assessment occurs in communication disorders subjects and on clinical placements. Psychometrics is an abstract area that is not popular with students. This section of the research aimed to examine whether the explicit embedded links between psychometric principles and their application to specific speech pathology cases would make this area more accessible, relevant and hence more motivating for students. It was anticipated that speech pathology students would perform better on this task than the psychology students because the learning context had a higher degree of authenticity. This stage of the research is also explored in Chapter 6.

In the previous two stages of the research, the tasks explored how the context of learning may influence the learning of individuals. In the final stage of this research, collaborative learning using the OLM as a stimulus material was explored to investigate learning experiences where the learning context has a higher level of authenticity. A second year, third year and fourth year speech pathology student were paired with a clinical educator to work through the learning module. It was anticipated that this stage of the research would allow greater exploration of the processes of socialisation in learning through interaction between the students and the clinical educator and provide some preliminary insights into how the level of experience of students impacts on both teaching and learning. This stage of the research is outlined in Chapter 7.
In the previous chapter, an educational framework that recognised the contribution of both constructivist and social approaches to learning was proposed. Contributions of both these theories enabled development of a learning methodology which emphasises the incorporation of principles of instructional design within a situated cognition framework. To enable these two approaches to be aligned, the use of authentic learning activities is considered to be essential. However, despite the importance of authenticity, the concept of authenticity has a tendency to be assumed to be common knowledge rather than having clearly defined characteristics and guidelines for educators.

In this chapter the concept of authenticity is examined in more detail. Examining the essential elements of authenticity is important to guide educators in implementing the key characteristics of authentic learning experiences. Developing an understanding of the essential components of authenticity is particularly important when incorporating technology into authentic learning activities. Following an approach that combines principles of instructional design within a situated cognition approach, the Online Learning Module (OLM) that was developed is presented in the final section of this chapter. Development of the OLM drew on the core principles of authentic activities outlined in the earlier sections of this chapter. In Chapter 4, a methodology for incorporating the OLM is presented. The subsequent chapters then examine the usefulness of the OLM both as an example of an authentic activity and a learning tool for students in a variety of learning contexts with reference to the integrated education framework.

### 3.1 Why Examine Authenticity?

From a sociocultural perspective authentic learning opportunities and facilitation of learning by members of the community of practice are essential aspects of the learning process. Using instructional design within a situated cognition framework has been proposed as a teaching methodology which may provide educators with a way of bridging the gap between classroom based and clinic based learning experiences. Central to this educational framework is the use of authentic activities. Whilst the importance of authentic learning has been strongly advocated, research that defines authenticity and identifies critical aspects of authentic learning to guide curriculum and assessment design is only just beginning to emerge. This provides a dilemma for educators as there is limited literature to guide them in the best methodology to apply when creating authentic learning environments and associated assessment processes.
From the perspective of tertiary institutions, when designed appropriately, authentic learning and assessment processes offer opportunities to ensure that students can apply their knowledge to real-life situations within their community of practice. This also provides assurance to members of the community of practice that new graduates enter the community with an adequate ability to participate in core speech pathology activities. Professional and vocational training degrees therefore require a change in learning goals from a focus on knowledge acquisition to increased emphasis on professional competence. Teaching and assessment of competence is more attuned to authentic assessment because it teaches and assesses students in the context in which they will apply their skills. In the case of assessment, using authentic assessments increases the level of construct validity in assessment processes (Gulikers, Bastiaens & Kirschner, 2004). Gulikers and colleagues (2004, pp. 67-68) describe this shift in learning goals as follows:

Here, the goal of [authentic] assessment is the acquisition of higher-order thinking processes and competencies instead of factual knowledge and basic skills. The function of the assessment changes from being summative to also serving a formative goal of promoting and enhancing student learning.

As alluded to in the above quote, authentic learning and assessment also provides tangible benefits for speech pathology students. Students entering the speech pathology degree program enter a highly specialised, narrow field of knowledge and expertise with really only one career outcome: becoming a speech pathologist. Research has demonstrated that, when students view learning experiences and assessments as having highly tangible outcomes, they are more likely to engage and persevere with the learning and assessment materials and therefore gain greater learning outcomes. This increases the degree of consequential validity which has a positive effect on student engagement with assessment and learning materials (Gulikers et al, 2004).

### 3.2 Defining Authentic Learning and Assessment

Whilst there has been growing recognition of the need to investigate how to develop authentic curriculums and authentic assessments, research on defining authenticity, authentic learning and authentic assessment is still in its infancy. Harriman (2008, p. 43) sums this up by saying: “While authenticity is universally held to be a positive attribute, there is little clarity or consensus around what it means or how it can be achieved, especially for school-based learning.” Gulikers and colleagues (2004) suggest that one of the reasons authenticity has not been well defined in the literature is that researchers believe they intuitively know what authenticity is. The simplest definitions of authenticity describe authenticity as being realistic or
true to life. As previously discussed Herrington & Kervin (1997, p. 223) describe authentic activities as “...the kind of activities that people do in the real world.” However, in their review of the literature Gulikers and colleagues (2004 p. 69) found a variety of different perspectives surrounding authenticity emerged including:

- Synonymous with performance assessment.
- Realism of task and context.
- Fidelity differentiates between authentic and performance assessment.
- Similarity of cognitive demands of assessment and actual real life situation.
- More than cognitive demands – also metacognitive and social competence.

From an instructional perspective many of these areas are important to consider when planning learning activities. Recently, the development of two authenticity frameworks has provided more concrete guidance for educators interested in developing authentic activities. These are explored in detail in the following section.

### 3.3 Frameworks of Authenticity

There is increasing recognition of the need to develop frameworks to guide curriculum development and assessment within an authentic learning framework. In this thesis, frameworks for both authentic assessment and curriculum development are presented together in the same chapter and the same section. The rationale for this is that, in an authentic learning framework, assessment and learning experiences should be very similar and highly integrated processes. Frameworks that guide curriculum development will also naturally guide assessment procedures.

#### 3.3.1 Authenticity Frameworks for Curriculum Design

Harriman (2008) suggests a framework that describes key aspects of authentic tasks which can be incorporated into classroom activities. She describes two broad categories of authenticity: field authenticity and authenticity of consequence. Field authenticity describes how closely the tasks and the processes students use match real life scenarios. Authenticity of consequence refers to how authentic the results of the learning experience are. This includes the products of learning and also the audience that these products are presented to (Harriman, 2008). She considers that the results of learning are equally important as the process of learning: “Authentic consequences substantially contribute to students’ engagement in activities, especially as external audiences give value to students’ work.” (Harriman, 2008 p. 45). She recognises that there is a continuum of authenticity and that not all tasks will involve all aspects of authenticity, but activities that encompass more aspects of the framework are likely to be more beneficial for students.
Herrington and Kervin (1997, pp. 221-222) summarise key principles from social learning theory which should be considered when designing curriculum within a social learning theory framework:

- Provide authentic contexts that reflect the way the knowledge will be used in real life
- Provide authentic activities
- Provide access to expert performances and the modelling of processes
- Provide multiple roles and perspectives
- Support collaborative construction of knowledge
- Promote reflection to enable abstractions to be formed
- Promote articulation to enable tacit knowledge to be made explicit
- Provide coaching by the teacher at critical times, and scaffolding and fading of teacher support
- Provide for authentic, integrated assessment of learning within the tasks

Care must be taken to ensure that activities are realistic and likely to be encountered in real life. When discussion focuses on the provision of realistic learning scenarios, it is often stated that using case studies or problem-based learning are not new concepts. At a superficial level the case studies and problem-based scenarios may appear to present realistic case discussions. However, social learning theories demand a higher degree of authenticity than simply presenting a realistic clinical case. The information arising from the case scenario must be presented in a form that resembles the manner in which that information would be encountered in the real world (Herrington & Kervin, 1997). Such an approach requires students to be presented with the big picture first, including the type of redundant information that typically needs to be sorted through and discarded. For students, determining the relative importance of the information is as important as the synthesis, interpretation and identification of gaps. One of the key issues of using technology within a social learning theory framework is how to give appropriate modelling and feedback. Expert modelling can be incorporated into the structure of technology by providing examples of how more experienced learners or professionals deal with certain situations. Another way of incorporating modelling into learning situations involves embedding information about how to use cultural tools into learning materials (Herrington & Kervin, 1997). Authentic learning environments provide an excellent opportunity to explore different perspectives, priorities and roles of different professionals. They also enable students to experience different perspectives and to evaluate the strengths and weaknesses of different sources of information (Herrington & Kervin, 1997). Opportunity for discussion with peers is another important aspect of learning. Authentic learning activities lend themselves well to group work. Group work models the type of collegial collaboration and problem-solving that occurs frequently in the workforce. Authentic environments may also assist with deeper learning than rote learning (which is quickly forgotten after assessment). The
synthesis and reflection required for completing authentic tasks, and the social nature of this learning provides greater opportunities for self-reflection (Herrington & Kervin, 1997).

3.3.2 A Five Dimensional Authentic Assessment Framework

In describing their framework of authentic assessment, Gulikers, Bastiaens and Kirschner (2004) highlight that the current emphasis on performance and competency in vocational courses is more closely aligned to the concept of authentic assessment than traditional knowledge acquisition based assessment processes which typically have a high memory component. As discussed previously, they suggest that authentic assessment processes appeal for two reasons: their congruence with workplace competency increases their construct validity as assessment tools; and their relevancy to workplace skills improves student motivation to perform well due to perceived relevancy of the assessment process. In their definition of authentic assessment, the assessment process should require the same knowledge, attitudes and processes that are required in the profession. They maintain that, despite this definition, determining an authentic assessment process is difficult for educators because judgements about authenticity remain highly subjective. Gulikers and colleagues (2004) attempted to assist educators with this task by developing a framework for authentic assessment through a review of the literature. They identified five dimensions of authentic assessment: the assessment task, the physical context, the social context, the assessment result or form, and the assessment criteria (Gulikers, Bastiaens, & Kirschner, 2004, pp. 71-75). The assessment task must be perceived as being relevant and representative of professional tasks. Like Harriman (2008), they highlight the complexity of multiple sources of information often confronted by professionals. They also perceive that the authenticity of the learning task should create a feeling of ownership in students similar to the problem solving ownership that occurs amongst professionals when they are solving real-life problems. The importance of the physical task has already been highlighted in previous discussions relating to the importance of situated learning. The physical environment provides many contextual cues which facilitate practice in real life settings. Even in realistic tasks, if the setting varies (for example, the level of pressure, time restrictions, climate conditions, level of background noise or level of danger), then the assessment process many not provide an accurate representation of competency in the field. Gulikers and colleagues (2004) report that in computer based technology, the term fidelity is often used as a term to describe how closely a computer simulation reflects the real situation. This is discussed in greater detail by Alessi (1988) who argues that there is not necessarily a linear relationship between student learning and the degree of fidelity of the learning task. Rather he argues that more advanced students benefit from opportunities to engage in higher
fidelity simulations, whereas less advanced students often find the greater cognitive load associated with the realities of realistic practice hinder learning.

The social context can also have a strong influence on the level of authenticity of the assessment process. Social processes that assist learners when engaged in the real world should be considered when designing authentic assessments. However, unlike Herrington and Herrington (2007), Gulikers and colleagues (2004) suggest that collaboration does not always have to be present for activities or assessments to be authentic. Whether collaboration is present or not should reflect whether the task is performed individually or collaboratively in real life settings. In relation to assessment result or form, Gulikers and colleagues (2004, p. 75) suggest that the nature of the assessment task should be characterised by four elements. It should: resemble a real life quality product or performance; allow adequate demonstration to assess underlying competencies in the field; provide multiple tasks to make a representative decision of student competencies; and require students to present and defend their work to other parties. They define two terms in relation to assessment: criteria refer to the elements of the assessment that are valued; and standards relate to the level of performance expected within the assessment process. These measures should be transparent and readily available to students prior to engaging in learning and assessment tasks. Each of these dimensions can vary along the continuum of authenticity and there is a reciprocal relationship between them. Furthermore, because assessment and learning processes are closely aligned in authentic tasks, the assessment framework can also be used to guide the development of authentic learning tasks. Despite the attractions of authentic assessment Gulikers and colleagues (2004) caution that on occasions other forms of assessment may be more appropriate such as when measures of objective attainment are required. They also caution that the level of complexity of authentic assessment may make it less suitable for lower level or beginning learners, as the complexity of presented information may result in cognitive overload. In these cases some of the context may need to be simplified until learners have the skills required to handle increased complexity.

### 3.4 Combining Technology and Authentic Learning

The idea of using technology as a learning tool may on first examination appear completely at odds with a theory of learning that emphasises authentic, situated learning experiences with socialisation as the primary mechanism of learning. However, Herrington and Kervin (1997, p. 220) suggest that, when designed appropriately within this framework, new methods and possibilities for the use of technology emerge: “Rather than being used as a means to efficiently transmit information and content to learners, technologies can be used by students as ‘intellectual partners’, and as tools to analyse and interpret their understanding.” Computer aided teaching can have several advantages for educators including providing introductory
materials on topics which frees up tutor time for more in depth discussion. However, there has been criticism that there is more emphasis in the literature on the technical and economic aspects of this technology than the educational principles underlying it (Vogel, 2002). The following discussion provides some illustrations of how educators have developed computer assisted instruction with reference to principles of authentic learning, instructional design, situated cognition and social theories of learning.

Squire (2006) explores video games as a form of designed experience, arguing that educators could draw many learning and design principles from their success. Games engage players in what Squire (2006) refers to as a ‘culture of simulation’ where players learn through a process of doing and being. He suggests that educators should engage in research that explores how players make sense of these virtual worlds. In particular players learn complex rule systems and the consequences of these rules on game play. In complex games, game designers successfully embed learning structures to help players learn. In games there is an emphasis on learning through performance or doing. By interacting with characters, players develop a sense of identity and an understanding of the parameters of the virtual world. Players transfer their identity into the world and work out how to be in the world. Games are mediated by their own social structures with achievement measured by successful completion of challenges, goals and practices.

McLellan (1991) identifies the potential for the development of virtual learning environments within a situated cognition instructional design framework. She (McLellan, 1991, p. 32) reports that the six key features in learning scenarios necessary to employ these techniques: apprenticeship, collaboration, reflection, coaching, multiple practice and articulation which were originally identified by Brown and colleagues (1989) have considerable potential to be embedded in virtual learning environments. She reviews several examples of how these elements have been combined to assist in training people to function optimally in highly stressful situations through the use of highly realistic simulations. Applications have included training military helicopter pilots to fly combat missions, teaching airline pilots to respond to mid-air emergencies, treating medical conditions on the battlefield, and simulating emergencies in nuclear power plants.

Hung (2001) examined the potential of the web as a platform for situated learning with reference to three essential components of learning: learning is demand driven, learning is a social act and learning occurs through ways of ‘seeing’ within a community of practice. He perceived that the web could provide a way of linking the classroom with the practices of the community. When considering the demand driven nature of learning he emphasised that the content should be personalised to the learners and embedded in meaningful activities. In relation
to the social nature of learning he stressed the need for learning environments to engage students in collaboration and social aspects of the community including the tools and language of the community. Web-based learning sites should also be structured to allow adequate scaffolding and contain realistic hierarchies of more experienced community members to facilitate learning and the development of learners’ identities. These environments must also provide adequate opportunities to facilitate learners’ reflection on their practice.

Computers are also gaining increasing recognition as a learning tool to assist in situating skills in context when real authentic environments are not available. Choo (2007) combined constructivist and situated cognition approaches to develop a computer-based learning environment to assist students develop career life skills. In designing the computer learning environment Choo (2007) developed a framework to guide development called APLUS. This framework involves integrating Merrill’s (2002) first principles of instruction with a situated learning approach which allows complex tasks to be broken into manageable tasks through five stages: activate, plan, learn, use and show. In the activate stage, students are presented with a real world task which provides the context for learning. The aim of this stage is to trigger learning by helping students to recall existing knowledge in an attempt to make integration of new knowledge with existing knowledge easier. For example, students in the study were given the task of preparing a business plan. Through a sequence of animation students became part of the situation and took on the roles of business people who needed to take the first steps towards planning a business venture. In the planning stage, students were given meta-cognitive scaffolds to focus, support and guide their planning of the development of the business plan. This support was provided in the form of a ‘Know, Need, Do’ chart that students were encouraged to fill out to form the basis of their action plan. In the learn phase the focus is on supporting students to gain more knowledge through the use of conceptual scaffolds and providing a range of resources for students to explore and extend their domain knowledge. In the use phase the students were instructed to apply their new knowledge to a real life task (for example, constructing a business plan). In the final stage, the show stage, students were asked to demonstrate their knowledge and business plan to peers. Students involved in the study reported greater interest in the learning topic when participating in the authentic activity and they also scored significantly higher in subsequent class assignments when compared to students exposed to conventional teaching methods. Despite these positive results, some potential barriers to maximising authentic learning were identified including: there is not enough time for learning; it is difficult to facilitate larger groups; it worked better for adult learners who were naturally more self-directed; and lecturers lack the training needed to optimally facilitate learning experiences in the classroom using computer media.
Resnick (1987) suggests that the use of simulated apprenticeship environments may assist students in making stronger links between theory and practice. She also suggests that they provide students with the chance to experience scenarios that they may not have encountered on practical aspects of their training because they are uncommon presentations. They also have the potential to provide students with safe simulated exposure to situations that in real-life can have dangerous consequences if students deviate from the correct decision making processes and actions.

Tan and Hung (2002) propose that Perkin’s Five Facet Learning Environment may provide guidance on the social constructivist elements to incorporate into online learning environments. Perkin’s (1992, p. 46) suggests that in any learning environment five key facets can be readily identified: information banks, symbol pads, construction kits, phenomenaria, and task managers, but these may not all be present in every learning environment. Information banks consist of resources that are explicit sources of information about topics such as textbooks, encyclopaedias, dictionaries, electronic media and communications, and teachers. Symbol pads consist of the tools such as notebooks and lap tops that assist students’ short term memories as they explore, develop and assimilate new information. Construction kits are similar to symbol pads in that they provide sources of information, but construction kits refer to tools which enable a much more active and manipulative approach to learning. For example, real objects like Lego, apparatus in a science laboratory and commands in computer programming all enable active manipulation of materials. Perkin’s (1992) coined the term phenomenaria to describe an area of a learning environment that is specifically designed to allow manipulation of phenomena. This specialist environment he suggests could be called a “phenomenarium” along similar lines to words such as aquarium and terrarium and consists of a specifically designed environment within the learning setting where various phenomenon can be presented, studied and manipulated. Apart from physical environments such as aquariums and science laboratories, advances in technology have enabled the development of virtual worlds and simulated environments using computer technology. Task managers are the final element in learning settings which dictate and direct students towards the set tasks that must be completed within the learning setting. As well as directing tasks, the task manager also provides guidance to students relating to the sequence or best methods to complete tasks. In face-to-face environments the task manager is usually the teacher, although more able and experienced students may be given considerable responsibility for the organisation and identification of tasks particularly during group work. With the increasing sophistication of information technology, there is now greater scope for electronic task managers to direct learning through computer aided instruction and intelligent tutor systems. Perkins (1992) suggests that learning
environments characterised by a situated learning approach benefit most from including a specifically designed learning environment.

There is growing recognition in medicine and health sciences that computer technology has considerable potential to assist undergraduates and professionals to develop their professional skills. In particular, computer technology has the ability to enable remote access to learning materials and input from other students and professionals. It also has the capacity to capitalise on the nature of adult learning which is typically self-directed, based on personal need and experience, and involves both practice and reflection on practice (Kelly & Mackay, 2003). Examples of how computer technology can support learning include the CELT (Computerised Evaluative Learning Tool) which was developed to support ongoing professional development in GPs (Kelly & Mackay, 2003) and the KOALA (Computerised Obstetrics and Gynaecology Automated Learning Analysis) which assists residents to collate an internet based portfolio of their clinical learning based on their encounters with real-life patients (Fung, et al., 2000). Computer aided learning has also been applied to the teaching of mental health units such as phobias, although feedback from students suggested the interactive nature of working as a group or incorporating the computer resources into a tutorial would assist learning more than completing the computer learning independently (McDonough & Marks, 2002).

Hung (2002) examined problem-based learning as a teaching methodology for a situated cognition approach to learning. Of particular interest to him was how this methodology could assist in the utilisation of technology in learning. He suggested that problem-based learning lends itself well to situated cognition approaches due to its emphasis on real life problems and activities as a starting point rather than interdisciplinary knowledge. This is in keeping with situated cognition approaches which emphasise the inseparability of knowledge from the context and relations between the participants and the environment. He suggests that immersion in authentic activities creates opportunities for students to develop two types of knowledge. Through participation students learn ‘knowledge about a discipline’ which enables them to take part in disciplinary discourse. Students also acquire ‘knowledge of the discipline’ which involves the technical skills and knowledge in the discipline. Hung (2002) suggests technology can support the use of authentic problem-based learning by providing opportunities for students to experience historical and social processes of learning.

A website on infant nutrition developed by dieticians was based on principles of social learning theory to provide information for child care providers (Clark, Anderson, Adams, Baker, & Barrett, 2009). The group that was given access to the website had positive changes in their knowledge and attitudes to infants being fed breast milk, formula and solid foods.
While there has been recognition that computer technology provides a powerful teaching resource, there has also been concern that many online courses and teaching materials have been implemented without adequate consideration of pedagogical and technical requirements (Wong, Greenhalgh, Russell, Boynton, & Toon, 2003). Wong and colleagues (2003) highlight that web delivery of courses requires the recruitment of staff members who have adequate information technology skills in addition to their academic skills and that the initial development of such courses is highly labour intensive. They also indicate that sometimes the degree of interactivity that these learning environments provide may be overstated. When examining comments from students into what aspects of online courses actually facilitated learning, having a structured learning environment with opportunities for tutor facilitated discussion and the opportunity to complete traditional essay assignments were identified as critical for student success. This emphasises the need to develop resources as learning tools rather than as complete learning courses.

### 3.5 Instructional Models of Open Learning Environments

Open learning environments are concerned with learning situations where divergent thinking and multiple solutions/perspectives are the goal rather than reaching the conclusion that there is a single correct answer (Hannafin, Land, & Oliver, 1999). This approach is very amenable to catering for a learning model that acknowledges both an individual and socially derived component of learning. This approach emphasises both the role of the individual in terms of prior learning, determining what is learnt and how their previous experience is likely to impact on their perception of presenting problems, and the importance of situating learners in authentic experience based problem-solving.

Hannafin and colleagues (1999) describe three contexts of learning which enable opportunities for open learning: externally-imposed, externally-induced and individually-generated contexts. In externally-imposed contexts, the educator specifies the problem but the learner is still free to explore the context and solve the problem in their own manner. In externally-induced contexts, the educator presents a problem context but the learner must determine what problem needs to be addressed and how they intend to solve it. In individually generated contexts the learner develops both the context and the nature of problems that need to be solved within it. They also describe two types of resources that can be used to develop learning contexts: static and dynamic. Static resources do not change when learners interact with them while dynamic resources change as they are used by learners.

The type of learning context developed determines the educator’s degree of input in scaffolding learners’ responses. There are a range of learning tools that may be integrated into
learning environments to facilitate learning. Hannafin and colleagues (1999) describe three types of tools that may assist learning: processing tools, manipulation tools and communication tools. Processing tools are designed to support the cognitive functioning of learners. They give the examples of: seeking tools (help locate/filter needed resources), collecting tools (help gather resources), organising tools (help represent relationships between ideas), integrating tools (help link new and existing knowledge) and generating tools (help create new things or artefacts to think with). Manipulation tools allow learners to explore ideas, beliefs and theories and test the validity of their approach. Communication tools facilitate the ability of learners to communicate with other learners, teachers and experts. Synchronous communication tools support real-time interactions and asynchronous communication tools support time-shifted communication (Hannafin, Land, & Oliver, 1999). In addition to learning tools there are also a variety of types of scaffolding which can be embedded into learning environments to guide and support learners. Hannafin and colleagues (1999) describe the following types of scaffolds: domain specific versus generic scaffolds, conceptual scaffolds (help determine what learners need to consider), metacognitive scaffolding (help determine how to think about the problem), procedural scaffolding (help determine how to use resources and tools), strategic scaffolding (advice on approaches to solving problems). This model of open learning environments in conjunction with principles of authenticity forms the basis of the design of the online learning module which is described in the following section.

3.6 Developing the Online Learning Module

The development of the OLM was an exploratory attempt to combine principles of instructional design and situated cognition to develop a learning tool which would assist students in making salient links between psychometric knowledge and the clinical application of this knowledge to the interpretation and integration of standardised language test results within the assessment process involved in diagnosing paediatric language disorders.

3.6.1 Learning Through the Eyes of a Clinician

The development of the OLM followed Winn’s (1993) suggestion that instructional design principles may be applied to situated cognition, provided that the nature of the activity situates the specific learning goals within authentic practice. As already discussed, the ‘situatedness’ of learning activities provides specific challenges for educators as it is impossible to situate all learning in clinical settings. Technology however, may provide a means to involve speech pathology students in classroom-based educational activities with a higher level of authenticity by allowing the creation of virtual clinical settings. The greatest advantage of the use of virtual clinical settings is the degree of ownership and active roles that students take in
case management. Rather than passively watching an interaction between another clinician and a client, in the case of a virtual clinic the student becomes the clinician and it is through the exploration of the clinic environment that the student discovers information about the client. Rather than being presented with a case summary the student must collate, summarise and evaluate the information sources and from these draw their own conclusions. This is also in keeping with constructivist approaches to learning which emphasise the active role that learners must take in the learning process.

3.6.2. Why Select Psychometrics?

Psychometrics was chosen as the subject for the OLM because it represents a content area that by its very nature is de-contextualised and highly theoretical. It is also taught by other disciplines, making it more difficult for students to apply in practice without specific contextually relevant instruction. Typically, students do not enjoy learning the subject area and find it difficult, which can compromise student motivation to employ deep learning strategies and invest the cognitive effort needed to fully master the subject. Psychometrics is concerned with testing and measurement and to assist clinicians to convert raw data obtained from testing a client into numerical values that allow meaningful comparison of performances between the individual and the population norms. When the client’s scores are converted, various statements can be made based on their relative performance when compared to the performance of the normative sample. Psychometrics is a form of mathematics applied to testing and measurement of performance and therefore many of the teaching concerns in the field of mathematics are also applicable to psychometrics.

Mathematics has been identified as a good area to study from a research perspective as the knowledge domain is relatively separate from other areas of learning (Korthagen & Kessels, 1999). The dilemmas relating to the abstract nature of the course content have been a topic of interest for teachers and researchers in mathematics (Korthagen & Kessels, 1999). Mathematics is identified as an area of study that students typically find hard to understand. Therefore there needs to be greater emphasis on the development of teaching methodologies to make these areas easier to understand and more motivating for students (Korthagen & Kessels, 1999). In mathematics, because of the difficulties of transfer for students, there has been a shift in emphasis to the development of ‘realistic mathematics education’ where learning is situated in familiar everyday contexts. By solving problems in context, learning goes from practice to theory rather than the opposite approach that often dominates traditional views of education (Korthagen & Kessels, 1999). Often there is a gap between students’ procedural and conceptual knowledge. This results in a situation where students cannot apply their conceptual knowledge to help them develop procedures for solving presenting problems. There is a tendency for
students to learn procedures by rote and then, because they do not truly understand the rationale behind them, they mechanically apply them without discrimination and reference to the presenting task (Hiebert, et al., 1996). They suggest that, because of this, mathematics can benefit from a problem-based approach. However, as they contend, the problem with the mathematics curriculum is not just the nature of separation between the conceptual and the procedural, it is also the negative impact that such experiences have on students’ attitudes and beliefs towards mathematics, which can reduce their willingness to engage in presenting tasks, particularly when these are challenging.

Added to the difficulties of psychometrics being an abstract subject, speech pathology students learn psychometrics in psychology courses and then need to transfer and adapt this knowledge to speech pathology practice. Psychometrics is taught in lectures and tutorials which may cater for students in a wide variety of undergraduate courses, and so it cannot be assumed that specific speech pathology examples are used to provide a context for the application of psychometrics for speech pathology students. If students are to learn to apply psychometrics to specific areas of speech pathology practice such as assessment, they need to be given specific problem-based scenarios which allow them to build their understanding of psychometric principles in a context relevant to speech pathology. Initially, problem-based teaching may provide a bridge between generic psychometric knowledge and the specific skills required by speech pathologists. Therefore psychometrics presented a challenging test case to see whether an online learning module could assist speech pathology students to apply knowledge learnt in other disciplines to specific speech pathology practice.

3.6.3 Psychometrics and Instructional Design

The remainder of this chapter outlines the development of an OLM to facilitate the application of psychometric knowledge as an illustrative example of how instructional design and situated cognition approaches may be combined, provided the learning tasks are situated in authentic activities. This section specifically relates to the instructional design component of developing the OLM. This involved identifying learning goals for the learning module, developing the content and procedural tasks for the OLM in relation to best theory and practice and identifying and adapting content of the OLM to accommodate and challenge students’ prior knowledge. In the following sections the implications of situating the task within a realistic clinical scenario are explored with reference to the creation of open learning environments and developing authentic activities.

The first instructional goal of the OLM was to create a learning experience which would provide students with an opportunity to apply psychometric knowledge to the
interpretation of standardised language assessments in a way that reflected realistic clinical practice. The Clinical Evaluation of Language Fundamentals Fourth Edition, Australian Standardised Edition (CELF 4 Australian) (Semel, Wiig, & Secord, 2006) was chosen as the standardised assessment to include in the OLM as it is a commonly used standardised assessment for school-aged children and was considered a valuable learning goal for students and a realistic clinical scenario. The initial stage involved a review of the current literature on best practice for test interpretation and the assessment process and a review of commonly used psychometric terms in test interpretation.

Sattler’s (1992) four pillars of assessment were used to guide the development and subsequent incorporation of additional sources of information into the OLM. These four pillars of assessment are norm-referenced tests, interviews, observations and informal assessment. A thorough assessment incorporates and integrates information from all of these sources. Kamphaus (1993) highlights the importance of collecting background information as part of an assessment. He also notes several variables relating to the test environment which may impact on performance including the timing of assessment, the influence of other participants, the physical arrangement of test materials and the appropriateness of the proportions and physical layout of the furniture. He also stresses the importance of developing rapport with children prior to commencing the assessment process and establishing a source of interest and motivation to assist in encouraging persistence when children are confronted by more challenging tasks. Recording observations throughout the assessment process is critical to assist in testing hypotheses about the performance of the child. Kamphaus (1993, p. 159) outlines several important principles in his integrative method of test interpretation:

- Collect and integrate data from a numerous sources
- Corroborate conclusions with multiple data sources
- Support conclusions with research
- Interpretation should be individualised
- Emphasise reliable and valid conclusions
- Deemphasise subtest profile analysis
- Minimise calculations
- Interpretation is an iterative process
- Emphasise apriori interpretation

When using a step-by-step interpretation process, Kamphaus (1993) stresses the need to initially write down hypotheses about potential performance prior to testing. As starting point for this, reviewing background information prior to commencing testing is an essential part of the process. For example, if a child presents for an assessment with a diagnosis of Down Syndrome, the literature on the cognitive functioning of people with Down Syndrome should already alert the examiner that performance is likely to be significantly below the average range. Whilst this example is based on the process of completing intelligence testing, the same process
is also applicable for the assessment of child language disorders. Performance levels using the total language score on the CELF 4 could either confirm or dispute this hypothesis. Following examination of the total language score, the next step is to examine the index scores and differences between them to determine whether they are statistically and clinically significant. Next, subtest scores linked to the calculation of specific index scores should be examined to determine whether there are significant fluctuations across the profile and to identify significant strengths and weaknesses. Individual subtest scores can then be examined to determine whether very specific strengths and weaknesses exist. In the final stage, decisions must be made about which hypotheses have been corroborated by the test data. Wherever possible, results should be interpreted in relation to the greatest composite scores as the greater volume of data collected to calculate these scores results in a higher level of robustness than smaller language samples. Additional sources of information can then be examined to determine whether these support the conclusions bases on the standardised test. In general Kamphaus (1993) recommends the use of two corroborating pieces of evidence to confirm test results.

Marquardt and Gillam (1999) also highlight the need to consider information from sources other than standardised assessments to ensure the ecological validity of the assessment findings. Ecological validity is concerned with ensuring that there is congruence between the findings of test results and observations of the behaviour being tested in real world contexts. Ruscello (2001) also highlights that diagnosis is not just about the administration of assessments; it is a complex intellectual process which involves the collection, integration and interpretation of a variety of sources of client data. Gillam and Hoffman (2001, p. 79) identify four ways to determine whether children have difficulties with cognitive or linguistic structures: administration of information processing tasks and measures; language sample analysis; dynamic assessment; and standardised testing. They maintain that these key areas should also be accompanied by assessment of children’s participation in social and educational settings through interviews with teachers, parents and the child; and through observation within these settings. Gillam and Hoffman (2001) maintain that as a de-contextualised measure standardised tests can be the least important measure, and if these assessment results are not critically evaluated with reference to other assessment data, they may present a misleading picture of a child’s abilities. When using these assessments they advocate the use of the 68% confidence interval to recognise the error present in standardised assessments. When administering assessments they also suggest it is important to characterise the child’s behaviour in terms of persistence, attentiveness, avoidance, and cooperativeness, as this can have a considerable impact on the interpretation of test scores.
Haynes and Pindzola (1998, p. 1) also acknowledge the complexity of the assessment process, describing it as the “synthesis of the entire field” because it requires the integration of psychometric knowledge, test administration techniques, observational techniques, creativity, and the ability to relate empathically to clients from a range of backgrounds. They describe this diagnostic process as a blending of science and art with the synthesis of sources of information such as case history, previous assessment, client observations, interview findings, and formal and informal testing (being the most challenging part). When examining test results, they describe an important step in development when clinicians realise that standard scores are not the definitive measure of a person’s abilities but rather an aspect of an individual’s communication ability. They go further to state that when clinicians gain this realisation they make an important transition from technician to professional clinician.

O’Neill (1995) describes three levels of standardised test interpretation: concrete, mechanical and individual. At the concrete level of test interpretation, no conclusions are drawn beyond the test scores. Information is highly test centred and describes rather than interprets test results. At the second level of test interpretation, the mechanical level, the emphasis goes beyond tests scores to evaluating the significance of differences between subtests and subscales such as index scores. At this level conclusions are drawn based solely on the test scores and significant differences are based purely on the statistical and clinical significance determined through calculations contained within the test manual. The highest level of test interpretation is the individual level. At this level, characteristics of the client are integrated into the assessment process; they serve as indicators of similarities and differences between test profiles and presenting difficulties which have resulted in their referral for assessment. Assessment results are interpreted with reference to factors such as test behaviour, including attention, motivation, and ability to cope with challenging tasks. Test results are interpreted with reference to test scores, other sources of information such as academic work samples, language samples and information from referral sources and significant others. Therefore, at the individual level, results become qualitative rather than quantitative and client-centred rather than been driven solely by population norms. At this level results are explained with reference to strengths and weaknesses of the individual. Any contradictions in the sources of data are commented on and interpreted. O’Neill’s framework made an important contribution to the development of scoring criteria for assessing the proficiency of students responses to questions associated with the OLM and test interpretation.

Plante (1996) raised the important point that often there is a focus on test validity but that there is less emphasis on the importance of the validity of the clinician’s interpretation of
the behaviours being assessed. Best practice dictates that standardised tests should be used in conjunction with other assessment including language samples, criterion-referenced tests, observational checklists and case history information (Mcfadden, 1996).

O’Neill (1995) highlighted that when standardised assessments are used for the purposes of funding there may be political pressure on clinicians to confine their level of interpretation to a mechanical level, particularly when other sources of information suggest that test results may underestimate a client’s true level of ability. Miller (1993) reports on how the social pressures of seeing larger caseloads are increasing clinician reliance on the use of standardised tests as a means of identifying disorder. This coupled with the reliance on standardised assessment for funding can result in an underplaying of the importance of including other assessment data to form a holistic picture of children’s abilities.

Definitions of norm-referenced scores included in the OLM were based on explanations included in the CELF 4 Australian manual (Semel, Wiig, & Secord, 2006), Kamphaus (1993) and Anastasi and Urbina (1997). Specific terminology related to assessment included raw scores, standard scores, index scores, percentile ranks, confidence intervals, and explanations of the difference between statistical and clinical significance when interpreting the index scores.

Based on current views of best practice, the OLM had specific learning outcomes in relation to the speech pathology curriculum. Prior to engaging with the OLM, students attended traditional lectures in psychology relating to introductory statistics and psychometrics. Particular emphasis was placed on the use and interpretation of standard scores, confidence intervals, percentile ranks, index scores in accordance with best practice and understanding the difference between statistical and clinical significance.

After establishing the educational content of the OLM the next challenge was to create an authentic learning situation that reflected a situated cognition approach to learning. The following sections outline the principles and processes that guided the OLM development as an authentic virtual clinical experience.

### 3.6.4 Designing the Learning Model

The development of the OLM focused on creating a cultural tool to assist undergraduate speech pathology students learn to apply psychometric knowledge in a speech pathology context. The design brief for this module was for it to be flexible enough to be used both as an independent learning tool and as learning materials to stimulate classroom discussion with peers or more experienced members of the speech pathology community of practice such
as clinical educators. The OLM was set in a virtual speech pathology clinic where the student assumed the role of speech pathologist. The student’s role was to navigate around a number of sites and resources in the clinic to interpret the language results for a school-aged child named Kylie. Once they had navigated around the information, the scenario was that they were to attend a virtual meeting with staff at the school and answer three specific questions relating to the assessment results. The design of the OLM drew on the work of Harriman’s (2008) framework of authenticity, and nine situated design elements (Herrington & Kervin, 2007; Herrington & Oliver, 2000) discussed earlier in this chapter.

Design of the OLM was also informed by Hannafin and colleagues’ (1999) model of open learning environments discussed in previous sections. Figure 13 demonstrates the principles of this model that were applied to the development of the OLM. The OLM was characterised as an externally imposed enabling context. This was due to the high degree of external control exerted on students because the questions and tasks they were expected to respond to were highly specified in the OLM design. However, it was still an example of an open learning environment because whilst the specific task of answering the questions was highly specified, the students had individual freedom to explore, select, and apply or ignore any of the knowledge obtained within the OLM when answering the questions.

![Figure 13: Application of open learning environment design components to the online learning module](image)
For simplicity, the resources embedded within the OLM were static. Although developing dynamic resources would be desirable from a perspective of realism, this was considered impractical for this study due to a number of reasons. Firstly, this study aimed to compare student performances from different groups and therefore it was important to ensure that all participants were exposed to a standardised presentation of resources. The use of static written resources also removed difficulties with audio or video clips as a confounding variable. Written resources also removed auditory memory as a variable in student performance. Restricting the model to static resources also reduced the size of the OLM, making it easier for students to download when they had slower internet access and/or limited download capacity. Although dynamic resources may appear more realistic and engaging to learners, recent research suggests that it is the level of authenticity of learning experiences as a whole rather than the actual dynamic realism of individual resources that determines the perceived effectiveness of the learning environment (Herrington & Oliver, 2000). The limited time allocated for participants to engage in the OLM also made the use of static resources more viable for this study as dynamic resources are more valuable when students are given repeated opportunities to manipulate them in different ways. The greater degree of technical complexity associated with developing, programming and embedding dynamic resources into the OLM was also a barrier to the inclusion of dynamic resources in this OLM. There were ethical considerations concerning the embedding of media into the OLM, for both static and dynamic resources, especially in the case of media of a real-life client. Specific concerns related to the possibility that copies could be made of the OLM that could be inappropriately used beyond the scope of their consent (for media to be used for educational purposes only).

Several cognitive processing tools were embedded within the learning module to assist student learning. For example, when students entered the OLM they were provided with their first seeking tool. Students initially completed a tutorial to ensure that they were made aware of all the different locations of information so they did not miss any resources. Once students were made aware of all the sources of information they were free to navigate around the OLM according. An example of the tutorial assistance is presented in Figure 14. A full copy of the OLM is contained in Appendix 1.
Organisation and collection of knowledge from resources was facilitated by stating the scenario at the beginning of the OLM and presenting the students with the questions they needed to answer in advance. This allowed them to evaluate the relative usefulness of resources for facilitating task completion as they navigated around the OLM. Information about new knowledge was embedded in resources so students could build on their existing knowledge when exposed to new concepts and apply this knowledge when generating answers to the online learning module questions. This information provided students with conceptual, metacognitive and procedural scaffolds to facilitate their ability to complete the online learning module task. For example, Figures 15 and 16 demonstrate an extract from a learning resource about index scores.

Figure 14: An example of the tutorial phase of the online learning module
### Differences in Index Scores

<table>
<thead>
<tr>
<th>Indexes</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Difference</th>
<th>Critical Value</th>
<th>Significant Difference (Y or N)</th>
<th>Prevalence</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive-Expressive</td>
<td>84</td>
<td>51</td>
<td>33</td>
<td>12</td>
<td>Y</td>
<td>&lt;0.1%</td>
<td>0.5</td>
</tr>
<tr>
<td>Language Content – Structure</td>
<td>74</td>
<td>54</td>
<td>20</td>
<td>11</td>
<td>Y</td>
<td>2.1%</td>
<td>0.5</td>
</tr>
</tbody>
</table>

From the table above, both the differences between the expressive and receptive language scores and the content and structure scores are significant statistically. The next important step is to establish how common this is in the population because it is possible to have differences that are statistically significant but still occur relatively frequently in the population.

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**Figure 15:** Example of embedded scaffolding

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### Level 2 Interpreting Index Scores

These scores give information about a student’s strengths and weaknesses in receptive and expressive language as well as content and structure. The purpose of index scores is to describe the nature of the language disorder.

Index scores are norm referenced with a mean of 100 and a standard deviation of 15. Use the confidence intervals rather than the actual standard score when interpreting assessment information.

For children aged 5-8, four index scores are calculated to complete level 2 of the assessment process.

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**Figure 16:** Extracts from the online learning materials on index scores
3.6.5 Developing an Authentic Context

In the online learning module (OLM), it was important to develop an authentic context where speech pathology students could apply psychometric knowledge. The broader clinical setting for the OLM was designed as a virtual speech pathology clinic. The intention was to make it resemble a typical community health clinic. The selected case was a child language assessment which included assessment data from a commonly used standardised assessment CELF 4 Australian edition (Semel, Wiig, & Secord, 2006). This test was chosen as the standardised assessment because it is a commonly used language assessment for school-aged children and developing proficiency with this assessment represented both a realistic and functional learning goal for students.

Once authentic content for the OLM had been determined, it was essential to ensure the OLM incorporated the principles of situated cognition in a structured manner. Herrington and Oliver (2000, pp. 25-26) used the situated design elements below to design a computer program to teach second year education students about mathematics assessment by setting up a simulated classroom:

- Collect and integrate data from a numerous sources
- Corroborate conclusions with multiple data sources
- Support conclusions with research
- Interpretation should be individualised
- Emphasise reliable and valid conclusions
- Deemphasise subtest profile analysis
- Minimise calculations
- Interpretation is an iterative process
- Emphasise apriori interpretation

Despite the simulated nature of the activity, analysis of interviews following participation in learning experience revealed that students actively engaged in the learning materials and appreciated the relevance of real life tasks. Their findings also emphasised the importance of collaboration when accessing materials to maximise learning. Herrington and Oliver’s (2000) key principles were used as an instructional framework to develop the OLM and the pre/post-test materials. Table 1 reviews the elements incorporated into the design and provides examples of how they were applied to the development of the OLM for speech pathology students.
Table 1: Summary of the application of authentic activities to the learning module

<table>
<thead>
<tr>
<th>Social Learning Theory Design Principle*</th>
<th>Example of how it was incorporated into the design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide authentic contexts that reflects the way the knowledge will be used in real life</td>
<td>Learning module was set up as a simulated community health speech pathology clinic, a common clinical setting for second year speech pathology students. Information within the module is embedded within authentic documents e.g. parent interview, report and progress notes.</td>
</tr>
<tr>
<td>Provide authentic activities</td>
<td>Students were asked to interpret language assessment results, a common task for paediatric speech pathologists.</td>
</tr>
<tr>
<td>Provide access to expert performances and modeling of processes</td>
<td>Clinical skills such as conducting interviews are modeled by the virtual speech pathologist within the learning module.</td>
</tr>
<tr>
<td>Provide multiple roles and perspectives</td>
<td>Perspectives of the teacher, parent, child and clinician are included in the learning module.</td>
</tr>
<tr>
<td>Support collaborative construction of knowledge</td>
<td>In one stage of the study students are paired with a clinical educator to complete the tasks associated with the learning module together.</td>
</tr>
<tr>
<td>Promote reflection to enable abstractions to be formed</td>
<td>Rather than just summarising information students are asked questions that require them to reflect on and justify their interpretation of the client’s diagnosis and identify areas for further investigation.</td>
</tr>
<tr>
<td>Promote articulation to enable tacit knowledge to be made explicit</td>
<td>Students are asked to provide written responses to questions. Students who completed the learning module with a clinical educator explore the materials verbally and collaborate to develop answers to the questions.</td>
</tr>
<tr>
<td>Provide coaching by the teacher at critical times and scaffolding and fading of teacher support</td>
<td>Instructions on how to understand test materials such as how to interpret index scores and confidence intervals are embedded in the learning module. When the task is completed with a clinical educator students also receive scaffolding and coaching as they complete the task.</td>
</tr>
<tr>
<td>Provide integrated assessment of learning within the tasks</td>
<td>Assessment questions are embedded in the task and reflect the clinical reasoning processes necessary to interpret language assessments.</td>
</tr>
</tbody>
</table>

* (Herrington & Oliver, 2000)
3.6.6 Ensuring Realistic Presentation of Materials

When developing the OLM it was important to consider the sources of information that would typically be encountered when completing a child language assessment. Some of this information would play a critical role in the assessment/interpretation process; other information provided would not have a direct bearing on the process but was presented to create the typical ‘noise’ present in everyday problems. In addition, some sources of information were deliberately ambiguous or incomplete with the aim of simulating situations where students need to identify gaps in knowledge and promote reflection on areas requiring further levels of enquiry.

In the case of this OLM the aim was for students to be socialised as speech pathologists. By engaging in this online learning environment the students assumed the role of a speech pathologist who had the responsibility of reviewing and interpreting the language assessment results of a school age child. To make assessment processes more realistic, the OLM task was designed to encourage students to collate and interpret assessment findings about the client, and then prepare to summarise these findings by answering questions posed to them at a meeting involving the key stakeholders. Key pieces of information were situated in an authentic way. In the speech pathologist’s office, students could navigate various sources of information by clicking on objects. For example, when students used the mouse to click on the client’s file they were presented with a section from the progress notes which provided information about the client’s behaviour during testing. They could also view extracts from a speech pathology report including test data. When the phone was clicked students had the option of reviewing a phone conversation with either the parent or the teacher (Figure 17).

Similarly, when presenting test data care was taken to ensure that the interpretive data tables were presented in a similar format to those actually used on the CELF-4 test forms and manuals to ensure a high degree of authenticity within the task.
3.6.7 Incorporating Expert Assistance into the Learning Module

The OLM was designed to be both a stand-alone learning experience and as a learning tool to be used collaboratively in the classroom. By exploring the resources contained within the OLM, students found models of how to conduct core elements of practice such as sensitively obtaining additional information during a phone call to a parent and a teacher. Care was also taken to provide expert advice on core clinical skills such as how to interpret test scores rather than just presenting the actual test scores. Additional opportunities for support by real professionals were provided in the experimental condition where students completed the OLM with the support of a clinical educator.

3.6.8 Incorporating a Variety of Perspectives

Several different roles and perspectives were incorporated into the design of the OLM. This was achieved by including a teacher, a parent and a speech pathologist as characters in the learning scenario. Each of these portrayed a unique insight into the issues associated with working with a child with a language disorder. Just as in real life, some of the information contained within the OLM was presented consistently across all roles and other pieces of information appeared to be contradictory or were missing.
3.7 **Summary**

This chapter has provided an overview of authentic learning activities and how these may be embedded within an educational framework incorporating situated cognition and instructional design. The development of the OLM provided an example of how these principles can be applied to the development of learning materials. Chapter 4 outlines the methodology and rationale of the studies examining learning through the use of the OLM in a range of contexts to explore the learning processes outlined in the proposed educational framework.
4.1 Aims, Hypotheses and Study Design

This thesis is essentially an exploratory study which has proposed an integrated framework to describe the development of professional artistry. The primary aims of this thesis were:

1. To develop an integrated educational framework to describe how individual and social learning processes may combine to facilitate learning and the development of professional artistry.
2. To explore current perspectives on authentic learning and use these principles to guide the development of an OLM.
3. To explore clinical educators’ perspectives on authenticity as they relate to the OLM.
4. To evaluate the learning outcomes of the OLM when used for individual self-directed study.
5. To investigate learning interactions when more or less experienced individual students used the OLM with a clinical educator.

The first two aims of this thesis have been addressed in the previous chapters. In Chapter 1 a review of the literature revealed a largely polarised view of learning with a tendency to emphasise individual constructivist approaches to learning or processes of socialisation with little consideration of how such approaches may be able to coexist. It was argued that the unique demands of learning to become a professional require the development of the individual through both constructivist learning processes and processes of socialisation within the community of practice. These unique learning demands necessitated the development of a new learning framework which could more readily account for how such processes could coexist and work as complementary learning processes to support the development of professional artistry. Chapter 2 addressed the first aim of this thesis by developing an integrated educational framework which proposed to describe how learning through constructivist approaches and processes of socialisation could be conceptualised as complementary cyclic processes of learning.

Central to this framework was the premise that the context of a learning activity would moderate the degree to which constructivist or socialisation processes of learning were the dominant learning loop. It was hypothesised that designing learning activities which situated students in authentic learning activities would provide the most effective classroom-based teaching strategy as they more readily enabled students to capitalise on both individual learning processes and processes of socialisation. Chapter 3 addressed the second aim of this thesis by exploring current research on authentic learning and developing an OLM as an illustrative
example of how principles of authentic learning and situated cognition could be incorporated into the design of learning activities.

As well as being guided by principles of authentic learning, the OLM content had input from a speech pathologist and a psychologist during the development stage to ensure the content related to the case study was considered to be sufficiently representative of a real-life case study. Both the speech pathologist and the psychologist were highly experienced practicing clinicians who were also university lecturers in their respective fields of expertise. However, given that authenticity is highly subjective, the most important indicator of validity would be acceptance of the learning materials as an adequately realistic representation of a clinical scenario by a larger group of professionals within the speech pathology community of practice. To determine this, the OLM was presented to a group of clinical educators who were given the opportunity to review the materials and then respond to an anonymous questionnaire. Of particular interest was whether a simulated case which did not contain video or auditory clips of a client would still be perceived as adequately authentic. It was hypothesised that their comments relating to the authenticity of the OLM would reflect the key aspects of the authenticity frameworks presented in Chapter 3 and provide guidance on what aspects of authenticity were perceived to be of greatest importance. Results and discussion relating to this stage of the research are presented in Chapter 5.

The final two aims of this study relate to exploratory research concerning the proposed integrated educational framework. Of particular interest was developing insights into how constructivist processes of internalisation and the process of socialisation related to social learning theories combine to facilitate the development of professional artistry. Within this framework it was argued that there is a continuum of authenticity for learning activities, and the degree to which these activities realistically reflect core practices of the community will impact on the relative dominance of constructivist or social processes of learning. To examine this, the first stage of this study aimed to explore the usefulness of the OLM as a self-directed learning material in two different learning contexts and the second stage explored the learning interactions that occurred between speech pathology students with different levels of experience and a clinical educator when using the OLM as a learning resource.

The first context for the self-directed study aimed to explore how students learn when they attend learning activities presented by disciplines outside their own community of practice. The second context explored how students learn when they attend learning activities presented by disciplines within their own community of practice. It is hypothesised that students from outside the discipline of speech pathology (psychology students) would find the OLM tasks more difficult than the speech pathology students because the materials reflected core
practices within the speech pathology community of practice. Social learning theories would suggest that this represents a more challenging learning environment for the psychology students because, when they are attending these subjects they are not exposed to concrete examples of how such knowledge relates to practice within their own community of practice. There are two reasons why materials presented in this way may be a more challenging learning environment for students. Firstly, if students are not able to perceive the relevancy of information to core practices, they may not value the information and adopt an approach to learning that achieves a pass in the subject, rather than developing deeper learning strategies that aim to extend and modify existing knowledge. Secondly, even if students commit to the cognitive effort of employing deeper learning strategies, they lack the cultural information to assist them in determining how this information would be utilised within the context of their own community of practice. In previous discussions it was revealed that part of the challenge of transfer is for students to perceive similarities between previous knowledge and the presenting situation and use this recognition to employ similar problem-solving strategies to the new presenting problem. It has been suggested that when members of the student’s community of practice do not make clear links between knowledge learnt in other disciplines and how it is applied within the community, students may not be able to effectively apply this knowledge within their community of practice. The results and discussion relating to this section of the research are outlined in Chapter 6.

In the above stage of this research, participants completed the activities independently, relying on their own learning and the learning scaffolds embedded within the OLM materials. The focus was on determining how individuals made sense of information when the information presented was situated in participant’s own community of practice or within another allied discipline’s. However, interaction and the scaffolding that occurs within these interactions are also important aspects of learning which need to be explored as they play a critical role in both processes of socialisation and constructivist approaches to learning by challenging participants’ existing knowledge schemas. Exploring how interaction and scaffolding facilitate learning was the final aim of this thesis.

In order to explore how interaction facilitates learning, two additional studies were proposed. The first involved pairing two speech pathology students at different stages in their degree to explore the OLM together. Unfortunately this part of the study was unable to be completed as, despite repeated recruitment attempts, insufficient numbers of participants were recruited to make this study viable. However, the second interaction study which involved pairing a second-year, third-year and fourth-year speech pathology student with a clinical educator was completed. The methodology was the same as the proposed peer collaboration
study with the student and clinical educator working through the OLM together. Of particular interest was an examination of the types of scaffolding that occurred within these interactions; the teaching processes the clinical educator employed to facilitate student development, and, whether these strategies changed depending on the level of experience of the student. These aspects of the study aimed to start a description of elements of learning and teaching rather than proving or disproving a particular hypothesis.

Whilst this task was not taking place in the context of a clinic, it represented the most authentic task on the continuum of authenticity for an activity situated within a classroom. Given the greater level of authenticity and the presence of a clinical educator, it was hypothesised that there would be greater evidence of processes of socialisation mediating learning within this context. It was also hypothesised that the level of socialisation may be greater with more experienced students due to their greater level of exposure to core practices within the speech pathology community. The results and discussion related to this stage of the research is outlined in Chapter 7. Chapter 8 then presents an overall discussion of the results in relation to the literature and proposes future directions for research.

4.2 Ethics Clearance

Ethical clearance was sought and approved by the University of Newcastle Human Research Ethics Committee – No: H-953-0205 and H-687-0308. This enabled the author to recruit speech pathology and psychology students and clinical educators to participate in this study which formed the basis of this thesis.

4.3 Structure of Remainder of this Thesis

Given the multistage nature of the research, Chapter 4 has provided a brief overview of the research design. The three subsequent chapters provide a detailed description of each stage in the research including specific methodology, results and preliminary discussion. Chapter 5 provides more detailed information concerning how the OLM was examined by a group of clinical educators to validate its level of authenticity. In Chapter 6, research focuses on the impact of two different contexts on individual learning. In Chapter 7 the focus shifts to examine the role of interaction in learning. Chapter 8 provides a more detailed discussion of the implications of this research in relation to the proposed integrated model of learning and the literature.
Chapter 5: Determining the Authenticity of the Online Learning Module

5.1 Determining the Authenticity of the Learning Module

In chapter 3, the Online Learning Module (OLM) was developed as a learning resource to help students learn to apply psychometric principles to child language assessment. The OLM was developed using a combination of principles of instructional design and situated learning. Presenting students with authentic learning activities is of central importance to a situated learning approach as contextual cues are considered to play an important role in learning. Therefore, it was important to ensure that the OLM had an adequate level of authenticity prior to presenting it to students. A review of the literature revealed several frameworks that provided guidance for the development of authentic learning materials however, the most valid assessment of authenticity was to determine whether members of the speech pathology community of practice would consider that the OLM represented an authentic clinical scenario. This chapter has the following research aim:

- To explore clinical educators’ perspectives on authenticity as they relate to the OLM.

It was hypothesised that the clinical educators’ comments relating to the authenticity of the OLM would reflect the key aspects of the authenticity frameworks presented in Chapter 3 and provide guidance on what aspects of authenticity were perceived to be of greatest importance.

5.2 Participants

A total of 29 clinical educators evaluated the OLM materials and the pre/post-test to ensure that they had an acceptable level of authenticity. The level of experience of clinical educators ranged from beginning clinical educators about to supervise their first student to experienced clinicians who had supervised ten or more students. The sample of clinical educators had a broad range of experience which is summarised below in Table 2. Due to the very small number of respondents (only 2) indicating they had 5-10 students, this group was subsequently amalgamated with the 3-5 students group to form a group who had supervised 3-10 students. Clinical educators were recruited from a range of settings including the university, the community, and student units based within community and hospital settings.
Table 2: Range of clinical experience of clinical educators

<table>
<thead>
<tr>
<th>Experience (number of students supervised)</th>
<th>Clinical Educators (number)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>9</td>
<td>31</td>
</tr>
<tr>
<td>1-2</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>3-5</td>
<td>7</td>
<td>24</td>
</tr>
<tr>
<td>5-10</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>10+</td>
<td>6</td>
<td>21</td>
</tr>
</tbody>
</table>

5.3 **Methodology**

The OLM was presented to a group of clinical educators as a presentation at a professional development day for clinical educators. Following the presentation the clinical educators were given the opportunity to review the materials. An anonymous questionnaire was handed out to all clinical educators. Clinical educators were invited to complete the questionnaire to provide feedback on the authenticity of the OLM. A copy of the questionnaire is provided in Appendix 2. The questionnaire consisted of a series of three questions where clinical educators were asked to rate the realism of the parent interview, teacher interview and the importance of the content contained within the pre-test and post-test. In these questions participants were asked to rate the degree of realism of the OLM materials on a rating scale ranging from strongly disagree to strongly agree. Results were analysed using descriptive statistics. Clinical educators were also asked to qualify their rating with a comment. The final three questions asked clinical educators to identify the best features of the OLM, features that needed improvement, and any additional comments that they wished to make. Clinical educator comments were explored with reference to Harriman’s (2008) and Herrington and Oliver’s (2000) authenticity frameworks.

5.4 **Data Collection**

All questionnaires handed out to clinical educators were collected regardless of whether they had been filled out to preserve the anonymity of participants. On the front page of the questionnaire clinical educators could indicate whether they gave their consent for their responses to be included in the research. A total of 30 questionnaires were collected and 29 clinical educators gave consent for the questionnaires to be used for research purposes.
5.5 Results

Overall the clinical educators agreed with the level of realism contained within the learning materials. The responses to individual questions are outlined below.

5.5.1 Parent Interview

The majority of clinical educators perceived the parent interview to be realistic (n=29, Strongly Disagree 0%, Disagree 17%, Neither Agree or Disagree 14%, Agree 66%, Strongly Agree 3%). However, interestingly, Figure 18 demonstrates a trend for more experienced clinical educators to rate the parent interview as having a higher level of realism than less experienced clinical educators.

![Figure 18: Clinical educators’ perceptions of the realism of the parent interview based on number of students supervised. Note: SD (Strongly Disagree), D (Disagree), N (Neither Agree or Disagree), A (Agree), SA (Strongly Agree).](image)

Comments relating to the authenticity of the OLM typically reflected the challenges of making the static case-based learning experiences capture the dynamic nature of real-life clinical interactions. This was commonly reflected in the comments of clinical educators who wanted an increased number of clinical exchanges within the parent interview in order to allow the clinician to draw more information out from the parent through a greater level of clinical questioning:
“I think most parents would need more prompting to give this amount of information. If you wanted to target that aspect of clinical skills you could demonstrate more clinician prompting. Also often parents won't give as much detail - students need to infer where more information is required.”

Participant 2

Interestingly, the same comments were made by clinical educators who agreed and disagreed with the level of authenticity of the OLM. The higher proportion of more experienced clinicians who agreed with the level of authenticity may reflect a greater awareness or more sympathetic acknowledgement of the difficulties of creating learning materials that accurately reflect the dynamics of authentic clinical interactions.

5.5.2 Teacher Interview

Results indicated that the majority of the clinical educators agreed that the teacher interview was a realistic resource (n=29, Strongly Disagree 0%, Disagree 7%, Neither Agree or Disagree 3%, Agree 79%, Strongly Agree 10%). There was no clear indication that level of experience affected the responses of the clinical educators (Figure 19).

![Figure 19: Clinical educators' perceptions of the realism of the teacher interview based on number of students supervised](image)

Note: SD (Strongly Disagree), D (Disagree), N (Neither Agree or Disagree), A (Agree) SA (Strongly Agree)
Comments relating to the teacher interview were generally more positive in regards to the level of authenticity than in the parent interview. However, the same issues concerning the static versus dynamic nature of how information is revealed emerged:

“I agree that the info provided by the teacher was realistic however I find teachers generally require more prompts to provide that level of detail (e.g. SP asking specific questions about lunch time, news time etc).”

Participant 8

The other comment that was made by some clinical educators who did not consider the learning materials to be realistic related to the authenticity of clinical processes. Some clinical educators felt that referral for a cognitive assessment should have occurred prior to the speech pathologist becoming involved:

“I feel as though it's important that cognitive assessments are completed where possible before a language assessment.”

Participant 27

5.5.3 Psychometric Questions

In this question clinical educators were asked to comment on the importance of the psychometric content contained in the pre/post-test questionnaires in relation to the process of interpreting standardised language assessments. A copy of the pre-post test questions is contained in appendix 3. There was strong support from clinical educators regarding the content of the pre/post-test questionnaires (n=29, Strongly Disagree 0%, Disagree 0%, Neither Agree or Disagree 24%, Agree 41%, Strongly Agree 34%). Again, the level of experience did not have a clear impact on responses (Figure 20).

Clinical educators identified these questions as an important resource to assist students with consolidation of their test interpretation skills. They also acknowledged that it is an area of clinical practice that students often have difficulty with:

“.... [I] find that students always get confused re scoring assessment and do not have a good understanding of mean, standard deviation etc. This provides concrete examples.”

Participant 21

Some of the clinical educators also wanted to extend the relevance of the task to use it as a base to teach additional clinical skills such as parent feedback relating to test interpretation:

“I think it would be useful to encourage students to also use their interpretation of results to explain to parents the significance of assessment findings.”

Participant 2
5.6 Clinical Educators’ Comments and Harriman’s Authenticity Framework

Results provided support for the key elements of Harriman’s (2008) authenticity framework. Table 3 provides examples of how participant’s comments related to the key elements of this framework. Comments from participants highlighted the importance of both field authenticity and authenticity of consequence, with the majority of comments focusing on the authenticity of the task, the processes within the task and authenticity of audience. The authenticity of task was measured in terms of the overall accuracy of the content, whether the content contained the level of ambiguity reflected in real life, and by the variety of different sources of information which needed to be synthesised in order for participants to draw clinical conclusions.

The ‘authenticity of processes’ was also essential in clinical educator’s perceptions of whether the tasks were deemed to be authentic. The realism of the different characters in the OLM was judged based on the type of information they provided and also the accuracy of the clinical skills and processes modelled by the speech pathologist.
One interesting finding was the relatively low level of importance of audio-visuals to the perceived authenticity of the task. Surprisingly, the lack of real audio or video footage were not cited as major barriers to the task being perceived as authentic, with only one participant stating that it is not realistic to have to read interview transcripts. Most clinical educators were far more focused on the accuracy of the actual content of the transcripts and the clinical skills and processes reflected in them. Clinical educators did suggest that the materials could be improved by adding audio-visual materials but their rationales for this were about increasing student interest and engagement with the learning materials rather than increasing the authenticity of the task.

Authenticity of product may have been emphasised less because, unlike classroom-based activities in schools, the link between the content of the OLM and the real life clinical skills and applications associated with speech pathology are already apparent for speech pathology students. Despite this, several clinical educators wanted to extend the OLM activities associated with test interpretation to the next level to simulate providing parent feedback about test results, demonstrating that they are conscious that authenticity extends beyond case materials to reflect the realism of the products of participation.

Providing an authentic forum for clinical discussion amongst students and also extending the variety and complexity of clinical cases were also recognised as important ways of increasing the authenticity of the learning materials.
Table 3: Harriman’s (2008) authenticity framework

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Aspects of authentic practice</th>
<th>Contributing Elements</th>
<th>Examples</th>
</tr>
</thead>
</table>
| Field Authenticity    | Authenticity of task         | Accuracy and authority                                    | Participant 1<br>
I think there is too much information and it is a bit clear compared to what you would typically get from a parent. They often can’t remember specifics about language development and often can’t tell you what the grommets were for! I think it needs to be a bit more "vague" with less summary and interpretation by the speech pathologist so that the student learns how to integrate the information from the Father all together. |
<p>|                       | Open-ended or ill-structured problem | Participant 9&lt;br&gt;Great for encouraging “investigation” and looking at all info available when making a diagnosis. |                                                                                                                                 |
|                       | Multiple viewpoints and perspectives | Participant 26&lt;br&gt;Ability to use the module to integrate knowledge from all sources. Helping (teaching) students to realise that the formal assessment gives some info but all info needs to be considered when making decisions. |                                                                                                                                 |
|                       | Authenticity of process       | Roles and relationships                                    | Participant 3&lt;br&gt;Teacher gives info about general development and not just language which teachers tend to do. This teacher however is very good in her knowledge of 'language' and what speechies address which a lot of teachers are not. |
|                       | Multiple pathways through open-ended tasks | Participant 5&lt;br&gt;Usually teachers have already had school counselor assessment before referral to sp path in an effort to get funding. |                                                                                                                                 |
|                       | Modeled and scaffolded processes &amp; Expert guidance and inputs | Participant 13&lt;br&gt;Provides realistic information but also provides good examples of well-developed skills on the clinician’s behalf (active listening, providing information re: assessment and what the goals of therapy would be) - a good model for students. |                                                                                                                                 |</p>
<table>
<thead>
<tr>
<th>Dimension</th>
<th>Aspects of authentic practice</th>
<th>Contributing Elements</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authenticity of consequence</td>
<td>Authenticity of product</td>
<td>Consumers or users of products</td>
<td>Participant 21</td>
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<td></td>
<td></td>
<td></td>
<td>Functional outcomes of assessment - if they only score a PR of 0.1 for</td>
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<td></td>
<td>receptive language, what does it mean? Perhaps examples also of how</td>
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<td></td>
<td></td>
<td></td>
<td>to explain to parents.</td>
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<td></td>
<td>Diversity of possible products</td>
<td></td>
<td>Participant 18</td>
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<td></td>
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<td></td>
<td>I like the module’s potential for expansion. The ideas you mentioned</td>
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<td></td>
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<td></td>
<td>about video/audio would help and maybe provide a few different types</td>
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<td></td>
<td></td>
<td></td>
<td>of setting (e.g. hospital, school, specialist clinic, parent’s home,</td>
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<td></td>
<td></td>
<td></td>
<td>etc.).</td>
</tr>
<tr>
<td>Contribution of ICT (Information</td>
<td></td>
<td>Participant 11</td>
<td>Fantastic to get any more ‘clinical’ experience during studies and not</td>
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<tr>
<td>and Communications Technologies)</td>
<td></td>
<td></td>
<td>only useful but much more interesting to apply knowledge as you would</td>
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<td></td>
<td></td>
<td></td>
<td>in the real world clinic. Use of IT good.</td>
</tr>
<tr>
<td></td>
<td>Authenticity of audience</td>
<td></td>
<td>Participant 25</td>
</tr>
<tr>
<td></td>
<td>Consumers or users of products</td>
<td></td>
<td>Interactive nature. Audio/video in future would be a great asset to</td>
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<td></td>
<td></td>
<td></td>
<td>increase interest.</td>
</tr>
<tr>
<td></td>
<td>Other participants as audience</td>
<td></td>
<td>Participant 20</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Would act as a wonderful tool in small groups acting as a discussion</td>
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<td></td>
<td>point great to present a diverse range of unusual cases and situations</td>
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<td></td>
<td></td>
<td>so students could have some ‘experience’. Time efficient</td>
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<tr>
<td></td>
<td>Expert audiences</td>
<td></td>
<td>Participant 14</td>
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<td></td>
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<td></td>
<td>Case studies are always a great idea. How much feedback will the</td>
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<td></td>
<td></td>
<td></td>
<td>students get? It’d be beneficial to have a forum for students to</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>discuss.</td>
</tr>
</tbody>
</table>
5.8 Clinical Educators’ Comments and Herrington and Oliver’s Principles of Situated Learning

Results also provided support for Herrington and Oliver’s (2000) guide to incorporating situated learning principles into instructional design. Table 4 provides examples of how participant’s comments related to the key elements of this framework. Clinical educators commented on aspects of all key elements with the most common themes of comments being: providing modelling, opportunities for collaboration with fellow students, and the realism of the sources of information. The use of authentic assessment was not very prominent in clinical educators’ comments however, this may reflect their focus on the task of evaluating the authenticity of the OLM materials which were primarily information sources for students to evaluate, rather than being a source of assessment of students.
### Table 4: Relationship between clinical educators’ comments and Herrington and Oliver’s (2000) critical elements of situated learning

<table>
<thead>
<tr>
<th>Social Learning Theory Design Principle</th>
<th>Examples</th>
</tr>
</thead>
</table>
| Provide authentic contexts              | Participant 18  
  Maybe provide a few different types of settings (e.g. hospital, school, specialist clinic, parent’s home, etc.). |
| Provide authentic activities            | Participant 2  
  Exposure to realistic scenarios and interpretation. |
| Provide access to expert performances and modelling of processes | Participant 13  
  Provides realistic information but also provides good examples of well-developed skills on the clinician’s behalf (active listening, providing information re: assessment and what the goals of therapy would be) - a good model for students. |
| Provide multiple roles and perspectives  | Participant 26  
  Ability to use the module to integrate knowledge from all sources. Helping (teaching) students to realise that the formal assessment gives some info but all info needs to be considered when making decisions. |
| Support collaborative construction of knowledge | Participant 20  
  Would act as a wonderful tool in small groups acting as a discussion point great to present a diverse range of unusual cases and situations so students could have some ‘experience’. Time efficient |
| Promote reflection to enable abstractions to be formed | Participant 21  
  Functional outcomes of assessment - if they only score a PR of 0.1 for receptive language, what does this mean? Perhaps examples also of how to explain to parents. |
| Promote articulation to enable tacit knowledge to be made explicit | Participant 22  
  This would be helpful followed up by a tutorial discussion. |
| Provide coaching by the teacher at critical times, and scaffolding and fading of teacher support | Participant 12  
  I believe this (the case examples) is necessary to assist students to integrate stats into clinical assessments. |
|                                          | Participant 14  
  Case studies are always a great idea. How much feedback will the students get? |
|                                          | Participant 18  
  Safe, scaffolded introduction to clinical environment. Less stressful for the student. |
| Provide for integrated assessment within tasks | Participant 2  
  I think it would be useful to encourage students to be able to use their interpretation of results to explain to parents the significance of assessment findings. |

### 5.9 Discussion

Authentic learning environments are central to both situated cognition and sociocultural approaches to learning. However, despite the importance of authenticity within these approaches it is frequently ill defined. At an extreme level situated cognition approaches and sociocultural approaches have maintained that learning can only successfully occur in real-
life scenarios. However, this narrow view of authentic real-life environments does not readily allow the transfer of principles of authenticity to the classroom. For authenticity to work as a learning principle in the classroom environment, there must firstly be an identification of the core principles of authenticity and secondly a recognition that authenticity is not an all or nothing concept, but rather represents a continuum of learning experiences that relates both to the nature of the learning materials presented and the degree of congruence between the teacher and the learner’s community of practice.

In speech pathology courses there is a considerable focus on students gaining authentic clinical practice as part of their course. The challenge for educators is how to also include the principles of authentic learning in the classroom and marry these with the curriculum through the use of principles of instructional design. A considerable proportion of authenticity research has focused on this dilemma within the education system. This dilemma is greater for the primary and secondary education systems given the breadth of subjects covered and the more general educational outcomes for students. In the case of speech pathology, educators have the advantage that all subjects, whether they are classroom or clinic based, have the one goal of developing students into speech pathologists.

Despite the differences in learning goals, it was proposed that the frameworks of authenticity developed for education appear to be applicable to the design of resources for tertiary vocational courses such as speech pathology. Two authenticity frameworks were used to design and evaluate the authenticity of the learning module and pre/post-test materials: Harriman’s (2008) framework of authenticity; and Herrington and Oliver’s (2000) key principles of incorporating instructional design into situated learning activities.

Based on the survey results outlined in Tables 3 and 4, both frameworks appear to highlight critical components of authenticity and provide guidance of how principles of instructional design can be incorporated in authentic learning activities. Whilst the preliminary nature of this research and the small sample sizes of both participants and clinical case study resources limit the ability to generalise the findings, the research does raise some areas that warrant future research.

Comments of clinical educators reflected several key elements of Harriman’s (2008) framework of authenticity and Herrington and Oliver’s (2000) principles of instructional design. From the clinical educators comments accuracy of information and clinical processes outweighed the mode of presentation when determining levels of authenticity. Further research investigating the link between engagement and perceptions of authenticity from the perspective of students would be useful to determine whether their perception of the relative importance of
elements like audio-visual materials differs from clinical educators. Given the cost and increased instructional complexity of incorporating more sophisticated audio-visual technology this is an important area to investigate.

One of the biggest challenges emerging from this research is how to maximise the dynamic nature of learning experiences and incorporate these into the instructional design processes. To make learning experiences open ended and adequately ill-defined, robust and rich enough to allow repeated exposure requires the inclusion of a vast amount of resources. It also requires students to have considerable timeframes in which to explore these resources so they can maximise the learning opportunities that these resources provide.

Herrington and Oliver’s (2000) research suggested that incorporating the multiple sources of information and the different perspectives of characters within the learning task, and completing the tasks collaboratively, were more important to learning success than programming in complex interactivity between the software program and the learner. This has important benefits for educators as it reduces the required level of computer programming demands placed on educators keen to embrace these learning concepts. This is particularly crucial whilst research in the area is new, as commercially available platforms that enable user friendly compilation of case studies are not yet readily available.

Collaboration with peers or a more experienced member of the community of practice provides more authentic scaffolding processes than those developed through the use of preconceived built in scaffolding. The importance of interaction with peers and more experienced clinicians was also reflected in the clinical educators’ comments about the benefits of using the resources as a teaching tool in tutorials. It was unfortunate that the research involving peer collaboration was unable to be completed as it would have provided another perspective of the role and importance of peer collaboration. This is an important area of study to extend this research in the future. The role of collaborative learning between speech pathology students and a clinical educator is discussed further in Chapter 7. Further research also needs to examine the optimal amount of materials and learning time allocated for engagement with the materials. Timeframes and an understanding of the amount and level of complexity of information to include will help enhance the ability of educators to maximise the educational potential of these learning tools.
Chapter 6: An Investigation into the Role of Context in Individual Learning

In the previous chapter, the importance of developing authentic learning materials was explored through the development and subsequent evaluation of the authenticity of the Online Learning Module (OLM) as a teaching resource for speech pathology students. Proponents of authentic learning environments argue that engagement in authentic activities enhances student learning by allowing them to engage in realistic, intrinsically motivating activities that closely mimic real life experiences and problem solving. By situating learning in authentic experiences, students benefit from a methodology that demonstrates how to apply knowledge in real life practice. This reduces the learning load associated with having to transfer knowledge into a form that is applicable within their community of practice. However, there is a continuum of authenticity of materials and learning experiences, and it is not possible for all learning to be situated within completely authentic activities. This is particularly challenging for educators faced with the dilemma of how to design classroom-based activities that meet curriculum goals whilst still enabling students to engage in authentic practice. This chapter examines how the level of authenticity in classroom activities has an impact on learning. The aim of this research was:

- To evaluate the learning outcomes of the OLM when used for individual self-directed study.

Using the OLM, students’ ability to learn in two different contexts was examined: learning materials that are being presented in another discipline and, learning materials that are being presented within the same discipline as the students’ community of practice.

In this task students were engaged in self-directed learning. There was no opportunity for collaboration and students had to rely on their prior knowledge and the information contained within the OLM and case studies to formulate correct responses. It was hypothesised that students presented with information within their own discipline would find the learning tasks easier than students learning materials within a different discipline despite both groups of students attending the same introductory lectures on statistics.

6.1 Participants

A total of 44 first year psychology students participated in the research. Participants were recruited as part of the first year psychology research pool. As part of course credit requirements students are expected to participate in a series of research projects to gain research experience. Flyers were placed on the psychology notice board inviting students to participate.
A total of 43 second-year speech pathology students also participated in this stage of the research. Initially the aim was to recruit speech pathology students and then have them complete the study as a self-directed task so that the methodology was identical to the psychology students. However, without the same course incentives as psychology students, the number of speech pathology participants recruited was not adequate to make the research viable. Consequently, a revision in the design was made where speech pathology students individually participated in the pre and post-test and OLM as two computer laboratory tutorials as part of their regular speech pathology program and then were given the opportunity to consent to their data being used in research at the conclusion of the labs. In the first laboratory students completed the pre-test and in the second laboratory which occurred one week later they completed the OLM and the post-test.

6.2 Methodology

Students were randomly assigned to either an experimental group or a control group by selecting an instruction package which described the tasks for either the control group or the experimental group. There was one control and one experimental group for psychology students and another control group and experimental group for speech pathology students. Each instruction package contained a participant number for students to use throughout the research which allowed the researcher to identify which group the participant was in. All students completed the pre-test and the post-test which were identical. This consisted of twenty multiple choice questions based on two case studies relating to test interpretation of the CELF 4. Care was taken to present the data in tabular forms that reflected the layout of materials in both the CELF 4 and the OLM. Appendix 3 contains a copy of the pre/post-test.

The students in the experimental group also participated in the OLM which explained how psychometric skills were applied within a speech pathology context prior to completing the post-test. As part of the learning module students also completed three questions relating to the content of the learning module prior to completing the post-test. These questions were:

1. What did your interpretation of Kylie’s test results reveal about her language skills?
2. To what extent do you believe the assessment results provided an accurate picture of Kylie’s language skills? What else might you have liked to consider?”
3. Describe the factors that you believe might have impacted on Kylie’s language development.
Students in the experimental group also completed a brief survey to evaluate the usefulness of the OLM as a learning resource.

In contrast the psychology control group only completed the pre and post-test and did not receive instruction in psychometrics other than that occurring in regular scheduled lectures and tutorials. However, in the case of the speech pathology students, because the content was part of a classroom tutorial incorporated into the speech pathology curriculum, all speech pathology students completed the OLM. The only difference was the order of presentation of materials, with the control group only having access to the OLM after they had completed the post-test.

6.3 Data Collection

The psychology students entered all data online. The OLM questions were short answer and the pre and post-test had a multiple choice format. The speech pathology students completed their responses on paper. All participant responses were anonymous.

The results of this chapter are presented in four parts. The first and second parts report on the pre and post-test results using descriptive and inferential statistics. The third part of the results examines student responses to the three online learning module questions through a combination of content analysis, descriptive statistics and the application of the SOLO taxonomy (Biggs & Collis, 1982) and O’Neill’s (1995) levels of test interpretation. The final section of the results examines student responses to the survey to evaluate the usefulness of the OLM as a learning resource using descriptive statistics.

6.4 Pre-test Data Analysis and Results

6.4.1 Psychology Students

A total of 44 psychology students completed the pre and post-test. Figure 21 revealed the response pattern reflected a normal distribution with a score range of 3 to 15 (M=8.68, SD=2.939). The 5% trimmed mean was 8.65 which indicated that outlying scores did not have a large influence on the mean so they were retained in the data. The normal distribution of the curve was statistically confirmed with a non-significant result on the Kolmogorov-Smirnov measure with the significance value obtained greater than 0.05 (sig. value 0.070). Therefore the data met the assumptions of normality necessary to conduct parametric statistics.
An independent t-test was conducted to compare the pre-test scores for students randomly assigned to the experimental and control groups. There was no significant difference for pre-test scores in the experimental (M=9.26, SD=3.165) and control groups (M=8.05, SD=2.598), t(42)= 1.382, p= 0.174 (2 tailed). The difference in means was small (mean difference = 1.213, 95% CI: -0.559-2.985).

6.4.2 Speech Pathology Students

A total of 43 speech pathology students completed the pre and post-test. Figure 22 revealed the response pattern of the 43 participants reflected a normal distribution with a score range of 3 to 18 (M=9.79, SD=3.176). The 5% trimmed mean was 9.72 which indicated that outlying scores did not have a large influence on the mean so they were retained in the data. The normal distribution of the curve was statistically confirmed with a non-significant result on the Kolmogorov-Smirnov measure with the significance value obtained greater than 0.05 (sig. value 0.061). Therefore the data met the assumptions of normality necessary to conduct parametric statistics.
An independent t-test was conducted to compare the pre-test questionnaire scores for students randomly assigned to the experimental and control groups. There was no significant difference for pre-test scores in the experimental (M=9.96, SD=2.458) and control groups (M=9.60, SD=3.831), t(41)= 0.368, p= 0.715 (2 tailed). The difference in means was small (mean difference = 0.357, 95% CI: -1.600-2.313).

6.5 Post-test Data Analysis and Results

6.5.1 Psychology Students

A paired samples t-test was performed to determine the impact of the OLM on students’ scores on the pre and post-test questionnaire. As hypothesised, there was no statistically significant increase in students’ scores from the pre-test (M=9.26, SD=3.165) to the post-test (M=10.13, SD=3.020), t(22) =1.752, p=0.094 (2 tailed) for the experimental group. The mean increase in questionnaire scores was 0.870 with a 95% confidence interval ranging from -0.160 to 1.899. A paired sample t-test was also performed on the control group. Results indicated that there was also no significant increase in this group of students’ scores from the pre-test (M=8.05, SD=2.598) to the post-test (M=8.76, SD=2.047), t(20) = 1.558, p= 0.135 (2 tailed). The mean increase in questionnaire scores was 0.714 with a 95% confidence interval ranging from -0.242 to 1.671. A complete summary of the statistical analysis for psychology and speech pathology students is contained in appendix 4.
6.5.2 Speech Pathology Students

A paired samples t-test was performed to determine the impact of the OLM on students’ scores on the pre and post-test questionnaire. There was a statistically significant increase in students’ scores from the pre-test (M=9.96, SD=2.458) to the post-test (M=11.17, SD=2.198), t(22) =2.856, p=0.009 (two tailed) for the experimental group. The mean increase in questionnaire scores was 1.217 with a 95% confidence interval ranging from 0.334 to 2.101. The eta square statistic (0.27) indicated a large effect size. In the control group, a paired samples t-test was also performed. Results indicated that there was no significant increase in this group of students’ scores from the pre-test (M=9.60, SD=3.831) to the post-test (M=10.45, SD=3.034), t(19) = 1.269, p= 0.220 (2 tailed). The mean increase in questionnaire scores was 0.850 with a 95% confidence interval ranging from -0.552 to 2.252. A complete summary of the statistical analysis for psychology and speech pathology students is contained in appendix 4.

6.6 Learning Module Questions Data Analysis and Results

Participants in the experimental group for psychology were also asked to complete three questions relating to the OLM. A total of 17 responses were recorded for each of the three questions. All speech pathology students, regardless of whether they were in the experimental or control group, completed the OLM and associated questions as part of a classroom activity. The control group completed the OLM and questions after they had completed the post-test. A total of 40 responses were recorded for each of the three questions. Results were analysed qualitatively by completing a content analysis and examining the quality of the responses using a modified Structure of the Observed Learning Outcome (SOLO) taxonomy (Briggs & Collis, 1982). The SOLO methodology provides educators with a means to evaluate the quality of open ended responses to set questions, and has been adapted for use in a variety of subject areas. After reviewing these adaptations, the SOLO application for history appeared to be the most appropriate to adopt and modify for a speech pathology context. This version of SOLO was selected due to the similarities between the types of tasks students are expected to complete in history, and the questions contained in the OLM. Specific history tasks which had similarities with the learning processes within the OLM and broader clinical processes included (Briggs & Collis, 1982, p. 35):

- Drawing conclusions from a display of information
- Making value judgements about a historical event
- Reconciling conflicting evidence from different sources
- Constructing a plausible interpretation from incomplete data

Briggs and Collis (1982) developed the following descriptors for evaluating history responses which are outlined in Table 5. These descriptors demonstrate a hierarchy of
sophistication in relation to student responses, but there was a need to provide exemplars of what increasing levels of sophistication look like in relation to test interpretation. O’Neill’s (1995) stages of test interpretation were combined with this version of SOLO to create a version of a SOLO suitable for examining responses to the OLM questions.

Table 6 outlines the combined taxonomy. O’Neill’s (1995) stages broadly overlap with levels 2-5 of the SOLO Taxonomy. The SOLO taxonomy has greater sensitivity in determining transitional responses, so the data was analysed in relation to the SOLO taxonomy using its greater potential to differentiate between responses. O’Neill’s descriptors of test interpretation were used as a guide to the hierarchy of development of test interpretation skills and the level of sophistication of content that could be expected to be seen at varying levels of the SOLO taxonomy. In the case of Level 1 test interpretation, the focus of the OLM was on interpreting index scores, so students were not given data related to individual subtest scores. However, responses that listed index scores without any interpretation in relation to statistical or clinically significant differences were still classified as Level 1 responses because they were primarily enumerative rather than statistical in relation to their test interpretation approach.
### Table 5: SOLO taxonomy stage descriptions for history

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Prestructural</td>
<td>Student avoids the question (denial), repeats the question (tautology), a firm closure based on transduction.</td>
</tr>
<tr>
<td>1A Transitional</td>
<td>Student attempts to answer the question but only partially grasps a significant point.</td>
</tr>
<tr>
<td>2 Unistructural</td>
<td>An answer is based on only one relevant aspect of the presented evidence so that the conclusion is limited and likely dogmatic.</td>
</tr>
<tr>
<td>2A Transitional</td>
<td>An attempt to handle two aspects of the evidence is made, but they may be inconsistent and hence no firm conclusion is reached.</td>
</tr>
<tr>
<td>3 Multistructural</td>
<td>Several consistent aspects of the data are selected, but any inconsistencies or conflicts are ignored or discounted so that a firm conclusion is reached.</td>
</tr>
<tr>
<td>3A Transitional</td>
<td>Any consistencies are noted: several aspects are recognisable but the student is unable to reconcile them.</td>
</tr>
<tr>
<td>4 Relational</td>
<td>Most or all of the evidence is accepted, and attempts are made to reconcile. Conflicting data are placed into a system that accounts for the given context.</td>
</tr>
<tr>
<td>4A Transitional</td>
<td>There is a hint that closure, or a firm conclusion is not inevitable. There is a suggestion that a relating principle might account for the situation, but this is not spelt out.</td>
</tr>
<tr>
<td>5 Extended Abstract</td>
<td>There is recognition that the given example is an instance of a more general case. Hypotheses about not given examples are entertained, and the conclusions are held open.</td>
</tr>
<tr>
<td>SOLO Taxonomy Stage Descriptions for History (Briggs &amp; Collis, 1982, p. 36)</td>
<td>O’Neil’s levels of Test Interpretation (1995, p. 20)</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td><strong>Stage 1</strong></td>
<td></td>
</tr>
<tr>
<td>Prestructural</td>
<td>Student avoids the question (denial), repeats the question (tautology), a firm closure based on transduction.</td>
</tr>
<tr>
<td>1A Transitional</td>
<td>Student attempts to answer the question but only partially grasps a significant point.</td>
</tr>
<tr>
<td><strong>2</strong> Unistructural</td>
<td>An answer is based on only one relevant aspect of the presented evidence so that the conclusion is limited and likely dogmatic.</td>
</tr>
<tr>
<td>2A Transitional</td>
<td>An attempt to handle two aspects of the evidence is made, but they may be inconsistent and hence no firm conclusion is reached.</td>
</tr>
<tr>
<td><strong>3</strong> Multistructural</td>
<td>Several consistent aspects of the data are selected, but any inconsistencies or conflicts are ignored or discounted so that a firm conclusion is reached.</td>
</tr>
<tr>
<td>3A Transitional</td>
<td>Any consistencies are noted: several aspects are recognisable but the student is unable to reconcile them.</td>
</tr>
<tr>
<td><strong>4</strong> Relational</td>
<td>Most or all of the evidence is accepted, and attempts are made to reconcile. Conflicting data are placed into a system that accounts for the given context.</td>
</tr>
<tr>
<td>4A Transitional</td>
<td>There is a hint that closure, or a firm conclusion is not inevitable. There is a suggestion that a relating principle might account for the situation, but this is not spelt out.</td>
</tr>
<tr>
<td><strong>5</strong> Extended Abstract</td>
<td>There is recognition that the given example is an instance of a more general case. Hypotheses about not given examples are entertained, and the conclusions are held open.</td>
</tr>
</tbody>
</table>
6.6.1 Online Learning Module Question 1

Participants were asked to respond to the following question: “What did your interpretation of Kylie’s test results reveal about her language skills?”

The initial analysis commenced with a content analysis of key themes emerging from responses. Themes were identified from each response and additional content categories were added as new themes emerged. Each response was coded multiple times to reflect the variety of themes contained within the response. Results were analysed using NVivo qualitative data analysis software version 7 (QSR International, 2006). The results of the psychology students are summarised in Table 7. The majority of psychology participants were able to readily identify the key findings of the assessment results; that expressive language and language structure were the most impaired areas of language, and test scores indicated that the performance was below the mean and the level of impairment was severe. A smaller proportion of participants were able to describe the results in more detail with reference to relative strengths and weaknesses of the different index scores and/or relate the results to specific psychometric measures such as standard deviation, percentile ranks and measures of statistical and clinical significance.
Like the psychology participants, most speech pathology participants were readily able to identify the key findings of the assessment results; that expressive language and language structure were the most severely impaired areas of language. The key themes that emerged for speech pathology students are summarised in Table 8.

A larger proportion of speech pathology participants were able to describe the results in more detail with reference to relative strengths and weaknesses of the different index scores and/or relate the results to specific psychometric measures such as standard deviation, percentile ranks and measures of statistical and clinical significance. A complete summary of the content analysis is for psychology and speech pathology students is contained in appendix 5.
Table 8: Content of speech pathology responses to question 1

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of References</th>
<th>% of Respondents n=40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expressive language and language structure most affected.</td>
<td>37</td>
<td>92.5</td>
</tr>
<tr>
<td>Nature of disorder is severe</td>
<td>36</td>
<td>90.0</td>
</tr>
<tr>
<td>Receptive language is relative strength</td>
<td>29</td>
<td>72.5</td>
</tr>
<tr>
<td>Language delay/disorder</td>
<td>21</td>
<td>52.5</td>
</tr>
<tr>
<td>Receptive expressive difference</td>
<td>18</td>
<td>45.0</td>
</tr>
<tr>
<td>Significant (Statistically and/or clinically)</td>
<td>18</td>
<td>45.0</td>
</tr>
<tr>
<td>Comment on core language score</td>
<td>17</td>
<td>42.5</td>
</tr>
<tr>
<td>Language content moderately impaired</td>
<td>16</td>
<td>40.0</td>
</tr>
<tr>
<td>Content structure difference</td>
<td>16</td>
<td>40.0</td>
</tr>
<tr>
<td>Percentile rank</td>
<td>15</td>
<td>37.5</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>14</td>
<td>35.0</td>
</tr>
<tr>
<td>Mean</td>
<td>12</td>
<td>30.0</td>
</tr>
<tr>
<td>Identified need for intervention</td>
<td>10</td>
<td>25.0</td>
</tr>
<tr>
<td>Confidence Intervals</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td>Identified need for further assessment</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>Results support parent/teacher concerns</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>Related to classroom difficulty</td>
<td>4</td>
<td>10.0</td>
</tr>
<tr>
<td>Social difficulties</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Related to assessment notes</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Related to critical language period</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Related to developmental history</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Hearing</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Pragmatic difficulties</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Self esteem</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Responses to the OLM question were also evaluated using a modified version of the SOLO taxonomy (Briggs & Collis, 1982) in conjunction with O’Neill’s (1995) levels of test interpretation. Results for the psychology students are outlined in Table 9. The majority of psychology participants (n=17, 70.6%) provided multi-structural level responses to this question. Multi-structural responses provide a single point of view without acknowledging additional sources of evidence, which may suggest an alternative or opposing viewpoint. Typically students reported on the severe expressive language and language structure index scores but did not mention that the language content index (moderate disorder) and receptive
language index (mild disorder) were relative areas of strength. A smaller number of students (n=17, 17.6%) identified differences in the index score data but were not able to fully explain the differences in these index scores. Consequently, their responses typically consisted of quoting the index score or corresponding descriptor without further explanation or elaboration. Only a small proportion of psychology students (n=17, 5.9%) were able to give a relational response which explained the clinical implications of these differences in index scores. None of the psychology students incorporated additional sources of supporting information such as the parent or teacher interviews in their responses that characterised Level 4A transitional responses.

The greater ability of the speech pathology students to reconcile conflicting data (e.g. differences in receptive and expressive language abilities) was reflected in the SOLO taxonomy with the majority of students providing Level 3A transitional (n=40, 27.5%) and relational (n=40, 40%) responses. It was interesting to note that, even though there was concern from clinical educators that information presented in sources like the parent-teacher interviews was too obvious, only a very small proportion of speech pathology students (n=40, 12.5%) specifically related test results to other sources of information like these which were embedded in the learning module resources, and none of the psychology students did this. Responses also appeared to reflect O’Neill’s (1995) levels of test interpretation with a progression of sophistication from concrete uni-structural responses to much more complex individualistic discussions evident in relational and Level 4A transitional responses (see Table 9).

The lack of extended abstract responses which would examine bigger picture issues relating to test interpretation in addition to the content discussed in lower levels of the SOLO taxonomy may be due to the question specifically asking about test results which may have narrowed their field of focus. The second learning module question may also have limited students’ decision to refer to additional sources by pre-empting these issues (by specifically asking students to comment on the accuracy of assessment results). The results of Question 2 are outlined in the following section.
Table 9: Examples of student responses to question 1 related to the SOLO taxonomy

<table>
<thead>
<tr>
<th>SOLO Taxonomy Stage Description for Question 1</th>
<th>Percentage of Psychology Responses n= 17</th>
<th>Percentage of Speech Pathology Responses n=40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1 Prestructural  Student avoids the question (denial), repeats the question (tautology), a firm closure based on transduction. No examples were recorded.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1A Transitional  Student attempts to answer the question but only partially grasps a significant point. No examples were recorded.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2 Unistructural  An answer is based on only one relevant part of the test results. “Kylie has severe difficulties with expressive language.” Psychology Post 10</td>
<td>5.9</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>“Kylie's test results show her overall language skills are in the range indicating she has a language disorder. Kylie's test results also show her language skills are well below those expected of her age.” Speech Pathology Participant 15</td>
<td></td>
</tr>
<tr>
<td>2A Transitional  An attempt to handle two pieces of test information is made, but they may be inconsistent and hence no firm conclusion is reached. No examples were recorded.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3 Multistructural  Several consistent aspects of the data are selected, but any inconsistencies or conflicts are ignored or discounted so that a firm conclusion is reached.</td>
<td>70.6</td>
<td>15.0</td>
</tr>
<tr>
<td></td>
<td>“Kylie’s results revealed her core language score to be -2SD below the mean. It was found that her expressive language index and language structure index had a PR of 0.1%. Meaning she performed at the same level or higher than 0.1% of children her age. Kylie definitely has delayed language development.” Psychology Post 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Kylie fell behind in expressive language within the severe range with a percentile rank of 0.1. She also fell behind with language content index with a percentile rank of 4 indicating that out of 100 children 4 would have scored less than her. She also fell within the severe range for language structure with a percentile rank of 0.1.” Speech Pathology Participant 27</td>
<td></td>
</tr>
</tbody>
</table>
### SOLO Taxonomy Stage Description for Question 1

**What did you interpretation of Kylie’s test results reveal about her language skills?**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Psychology Responses n=17</th>
<th>Speech Pathology Responses n=40</th>
</tr>
</thead>
<tbody>
<tr>
<td>3A</td>
<td>Transitional Any inconsistencies are noted: several aspects are recognised but the student states the findings rather than explaining the clinical implications. “My interpretation and assessment revealed that Kylie had borderline-average receptive language abilities, that such limitations are rare in her age population, and that her areas of difficulty were expressive language and language structure.” Psychology Post 9</td>
<td>17.6</td>
<td>27.5</td>
</tr>
<tr>
<td>4</td>
<td>Relational Most or all of the evidence is accepted and attempts are made to explain the differences in findings with reference to clinical implications. “Kylie’s test results revealed she has a severe problem in expressing speech, she understands information but cannot reproduce it with speech. Her content language shows a moderate problem which can be associated to her understanding but not being able to reproduce. Her structure of language is a severe problem as she seems to give up with longer sentences as her speech will not allow her to voice them.” Psychology Post 3</td>
<td>5.9</td>
<td>40.0</td>
</tr>
</tbody>
</table>

Kylie’s test results indicated that her overall language abilities are severely delayed compared to those of her peers. Her receptive language skills are more developed than her expressive language skills and are borderline-average for her age. The test results therefore revealed that Kylie experiences significant difficulties mainly with use of language (expressive language skills). Areas of particular difficulty included Kylie’s syntax (demonstrated through her very low range language structure index). The differences between the expressive-receptive and language-content index scores were significantly different and occurred in less than 0.1% of the population. Therefore, the extent of difficulty Kylie experiences in relation to language skills is very rare.” Speech Pathology Participant 63
SOLO Taxonomy Stage Description for Question 1
What did your interpretation of Kylie’s test results reveal about her language skills?

<table>
<thead>
<tr>
<th>Percentage of Psychology Responses</th>
<th>Percentage of Speech Pathology Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>n=17</td>
<td>n=40</td>
</tr>
</tbody>
</table>

4A Transitional

Most or all of the evidence is accepted and attempts are made to explain the differences in findings with reference to clinical implications. Additional sources of information apart from psychometric test results are used as supporting evidence.

No psychology examples were recorded.

“Kylie’s language skills are below those of her peers. Parent reports indicate difficulties with expressive language and delayed language development. Teacher also reports difficulties with receptive language. Assessment notes also indicate poor pragmatic skills. Kylie’s CLS of 54 (CI 51-57) indicates that her overall language skills are severely delayed/disordered indicating a need for further assessment. Interpretation of index scores revealed that expressive language and language structure index were areas of weakness and with scores of 51 and 54 are severely delayed for her age. Receptive scores were higher (84) and the difference between receptive and expressive language was significant. This indicates that Kylie’s receptive language skills are much better than her expressive language skills. The difference between her language content and structure scores was also significant. Both differences occur in less than 2.1% of the population. This indicates that Kylie’s language skills are severely delayed/disordered and intervention would be necessary.” Speech Pathology Participant 51

5 Extended Abstract

Most or all of the evidence is accepted and attempts are made to explain the differences in findings with reference to clinical implications. Additional sources of information apart from psychometric test results are used as supporting evidence. A broader understanding of the general strengths and weaknesses of standardised assessments is demonstrated through the inclusion of additional supporting evidence (e.g. comments in file notes) that suggests that the test results may not give a complete picture of Kylie’s language abilities.

No responses were recorded.
6.6.2 Online Learning Module Question 2

The second OLM question asked participants “To what extent do you believe the assessment results provided an accurate picture of Kylie’s language skills? What else might you have liked to consider?”

Seventeen psychology participants also completed this question. All participants agreed that the results were accurate. Reasons cited included the congruence of the test results with the parental and teacher reports (n=17, 23.5%), and the psychometric properties and/or comprehensive nature of the language assessment (n=17, 17.6%). The suggested areas for further assessment are outlined in Table 10.
In the case of speech pathology students, there was greater variation in terms of whether they felt that the assessment results provided an accurate picture of abilities. Most students provided some information to support the accuracy of the results such as the correspondence with information from phone calls with the teacher and parent, but they were concerned that there were other indications such as the progress notes entries indicating her shyness that also provided a suggestion the assessment results may not be a true indication of Kylie’s abilities.
Table 11: Content of speech pathology responses to question 2

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of References</th>
<th>% of Respondents n=40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child's emotional state</td>
<td>20</td>
<td>50.0</td>
</tr>
<tr>
<td>Global development IQ</td>
<td>16</td>
<td>40.0</td>
</tr>
<tr>
<td>Relates to teacher &amp; parent comments</td>
<td>16</td>
<td>40.0</td>
</tr>
<tr>
<td>Informal assessment</td>
<td>12</td>
<td>30.0</td>
</tr>
<tr>
<td>Hearing</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td>Testing conditions</td>
<td>9</td>
<td>22.5</td>
</tr>
<tr>
<td>Developmental history</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td>Pragmatic difficulties</td>
<td>7</td>
<td>17.5</td>
</tr>
<tr>
<td>Psychometric test properties</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Social skills</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Speech &amp; phonological awareness</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>Greater interaction with child</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Use more conservative confidence interval</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Gap between index scores</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Stability of results due to young age</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Complete additional CELF subtests</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>OT assessment</td>
<td>1</td>
<td>2.5</td>
</tr>
<tr>
<td>Oral muscular assessment</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table 11 shows the content contained in speech pathology responses. Results were very similar to those of the psychology students with the child’s emotional state (n=40, 50%), global development/IQ (n=40, 40%) and information relating to parent and teacher comments (n=40, 40%) the most commonly cited content within their responses. A complete summary of the content analysis for psychology and speech pathology students is contained in Appendix 5.

Responses to the OLM question were also evaluated using a version of the structure of the SOLO taxonomy (Biggs & Collis, 1982) and O’Neill’s (1995) levels of test interpretation. Results are outlined in Table 12. Scoring using SOLO was based on responses to the first part of Question 2 concerning the accuracy of the test results: “To what extent do you believe the assessment results provided an accurate picture of Kylie’s language skills?”

The second part of the question which asked participants “What else might you have liked to consider?” was not included in the analysis as this type of question encourages students to list items rather than forming a cohesive argument thus rendering the SOLO taxonomy an inappropriate form of analysis (Biggs & Collis, 1982).
Overall, there was a greater level of sophistication in the psychology student responses to this question compared with Question 1, with the greatest number of responses being classified as level 3 multistructural (n=17, 35.3%). Participants were better at recognising that there could be some contributing factors impacting on the test scores such as shyness and avoidance of verbal tasks, but in many cases they still did not explicitly state how these factors impacted on the validity of the test results.

Despite the general improvement in the sophistication of responses there was also an increase in the number of Level 1 pre-structural responses (n=17, 23.5%). In this case a number of participants gave tautological responses that agreed with the test results without providing any justification for their opinion.

The same pattern was noted in speech pathology student responses with the majority of students (n=40, 30%) giving relational responses. As in the case of psychology students, there was an increase in Level 1 pre-structural responses (n=40, 5%) to this question, with students agreeing or disagreeing with the question without providing any reasoning for their answer. In general the speech pathology students demonstrated a greater ability to integrate both test results and other sources of information and discuss results both in terms of strengths and weaknesses, rather than giving an overall statement that discounted information that did not corroborate their opinion.

When answering this question, the speech pathology students demonstrated a greater ability to demonstrate a more individualised and sophisticated approach to test interpretation that recognises the importance of examining, integrating and evaluating multiple sources of evidence before reaching a conclusion. This reflected in the most advanced level of test interpretation within O’Neill’s (1995) levels of test interpretation.
Table 12: Examples of student responses to question 2 related to the SOLO taxonomy

<table>
<thead>
<tr>
<th>SOLO Taxonomy Stage Description for Question 2</th>
<th>Percentage of Psychology Responses n=17</th>
<th>Percentage of Speech Pathology Responses n=40</th>
</tr>
</thead>
</table>
| 1 Pre-structural Student avoids the question (denial), repeats the question (tautology), a firm closure based on transduction.  
“Yes it did provide an accurate assessment of Kylie’s language skills. It could be considered that Kylie has other learning disabilities as well.” Psychology Post 29  
“Yes, I believe that most aspects of assessment have been completed although a more in depth case history would have been beneficial.” Speech Pathology Participant 32 | 23.5 | 5 |
| 1A Transitional Student attempts to answer the question but only partially grasps a significant point. No examples were recorded for psychology.  
“Core language is a good place to start indicating that Kylie is having difficulties. Subtests of the CELF 4 need to be administered to get a better picture of the nature of these difficulties so appropriate targets can be chosen.” Speech Pathology Participant 27 | 0 | 7.5 |
| 2 Uni-structural An answer is based on only one relevant part of the information.  
“According to the data, we can be 68% confident that the scores for this child are accurate i.e. that this child’s scores fall within this range. Given that she is showing such a low language ability it might be more beneficial to look at the 95% confidence index. I agree with those wanting to look at general intelligence in the case, and I also feel that a close look at the social impact of her language is having for her both at home and at school would be helpful. Is she still communicating with friends or is she socially isolated because of a lack of skills?” Psychology Post 31  
“Due to the severity of Kylie’s language results it may be advisable to consider using a 90% confidence interval as this will provide more accurate results (rather than being 68% confident, could be 90% confident that Kylie’s scores fall within the specified range). Further testing would be required as Kylie may not have performed as well she normally would have as testing conditions can be daunting for children especially with a person who is a relative stranger.” Speech Pathology Participant 1 | 11.8 | 15 |
### SOLO Taxonomy Stage Description for Question 2

**To what extent do you believe the assessment results provided an accurate picture of Kylie’s language skills?**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
<th>Psychology Responses</th>
<th>Speech Pathology Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>2A</td>
<td>Transitional</td>
<td>An attempt to handle two pieces of information is made, but they may be inconsistent and hence no firm conclusion is reached. No examples were recorded.</td>
<td>0</td>
</tr>
</tbody>
</table>
| 3     | Multistructural | Several consistent aspects of the data are selected, but any inconsistencies or conflicts are ignored or discounted so that a firm conclusion is reached.  

*The use of confidence intervals, index scores and comparing the individual’s pathology to its prevalence in the general population provide an accurate picture of Kylie’s language skills. They indicate the range of language ability with a certain level of confidence, indicate comparatively where the problems are and show whether such problems are common or not in the wider population. Additional things that may have been helpful would be Kylie’s developmental history prior to school, her parents language abilities and possible language issues, any other physical ailments.*  

Psychology Post 20  

*Kylie is having problems with expressive language as her parents and teacher pointed out. This is supported by the results of the in CELF 4 where she is severely and significantly delayed in expressive language. Other areas to consider are general learning ability and Kylie’s current hearing status. OMA is necessary to reveal any structural abnormalities.*  

Speech Pathology Participant 53 |
| 3A    | Transitional | Any inconsistencies are noted, several aspects are recognised but the student states general findings rather than how factors specifically relate to different parts of the CELF assessment.  

*The consultation with her parents, teacher and personal consultation has provided an accurate picture of Kylie’s situation. More details need to be collected about Kylie when brought in for assessment. At present a relationship of trust has not been established between the speech pathologist. From the file notes minimal interaction was obtained between the speech pathologist and Kylie.*  

Psychology Post 24  

*Yes, the CELF 4 is a reliable test that has been revised a number of times. It is important to note that she was shy and didn’t cope well etc. This may have affected the likelihood of the answers being accurate. Informal assessment would also have been essential.*  

Speech Pathology Participant 4 | 29.4 | 10 |
SOLO Taxonomy Stage Description for Question 2

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Psychology Responses n=17</th>
<th>Speech Pathology Responses n=40</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Most or all of the evidence is accepted and attempts are made to explain the differences in findings with reference to clinical implications and/or specific CELF test results. No examples were recorded for psychology.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Kylie’s assessment results may not have been completely accurate due to her behaviour she was very shy. She did not feel comfortable completing assessments with verbal responses. Didn’t cope well with challenging tasks. I would have considered her language ability in a more comfortable setting due to her shyness. How her language skills are in the classroom and at home.” Speech Pathology Participant 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Most or all of the evidence is accepted and attempts are made to explain the differences in findings with reference to clinical implications. Additional sources of information, apart from psychometric test results are used as supporting evidence. A broader understanding of the general strengths and weaknesses of standardised assessments is demonstrated. No psychology responses given.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“The assessment results while appropriate for a standardised measure may not have been typical for Kylie’s true language abilities. Kylie’s file suggests she is a shy client, reporting to have made little eye contact, swinging on a chair, and putting her head down on the table when asked to do challenging tasks. A fairly large, formal, tedious, standardised assessment such as the CELF may not have been appropriate for Kylie’s personality. Administration details should be considered. Time of day, Kylie’s mood, and administration details should all be considered to provide an accurate picture of Kylie’s language skills.” Speech Pathology Participant 58</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.6.3 Online Learning Module Question 3

The final OLM question asked the students to: “Describe the factors that you believe might have impacted on Kylie’s language development.”

A total of 17 psychology participants completed this question. Participants identified ear infections (94.1%), starting school too early (82.4%) and the emotional state of the child (76.5%) as the key contributing factors to delays in Kylie’s language development. More detailed results are outlined in Table 13.

Table 13: Content of psychology responses to question 3

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of References</th>
<th>% of Respondents n=17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear infections/hearing</td>
<td>16</td>
<td>94.1</td>
</tr>
<tr>
<td>Starting school too early</td>
<td>14</td>
<td>82.4</td>
</tr>
<tr>
<td>Emotional state</td>
<td>13</td>
<td>76.5</td>
</tr>
<tr>
<td>Parent child Interaction</td>
<td>8</td>
<td>47.1</td>
</tr>
<tr>
<td>Medical conditions</td>
<td>7</td>
<td>41.2</td>
</tr>
<tr>
<td>Language delay – critical period</td>
<td>4</td>
<td>23.5</td>
</tr>
<tr>
<td>Global development</td>
<td>3</td>
<td>17.6</td>
</tr>
<tr>
<td>Limited early intervention</td>
<td>3</td>
<td>17.6</td>
</tr>
<tr>
<td>Older sibling</td>
<td>3</td>
<td>17.6</td>
</tr>
<tr>
<td>Repeating kindergarten</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td>Home environment</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Attendance at preschool</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Teacher child interaction</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Nature of testing procedures</td>
<td>1</td>
<td>5.9</td>
</tr>
</tbody>
</table>

The content from the 40 speech pathology student responses was very similar to the psychology student responses with ear infections/hearing (91.4%), starting school too early (82.4%) and the child’s emotional state (76.5%) the most frequently occurring topics of discussion. Results are summarised in Table 14.
Table 14: Content of speech pathology responses to question 3

<table>
<thead>
<tr>
<th>Reference</th>
<th>Number of References</th>
<th>% of Respondents n=40</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear infections/hearing</td>
<td>16</td>
<td>94.1</td>
</tr>
<tr>
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<tr>
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</tr>
<tr>
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<td>3</td>
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</tr>
<tr>
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<td>3</td>
<td>17.6</td>
</tr>
<tr>
<td>Repeating kindergarten</td>
<td>2</td>
<td>11.8</td>
</tr>
<tr>
<td>Home environment</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Attendance at preschool</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Teacher child interaction</td>
<td>1</td>
<td>5.9</td>
</tr>
<tr>
<td>Nature of testing procedures</td>
<td>1</td>
<td>5.9</td>
</tr>
</tbody>
</table>

A complete summary of the content analysis is for psychology and speech pathology students is contained in Appendix 5. The SOLO Taxonomy was not used in the analysis of this question due to the tendency of the question to encourage participants to list items rather than forming a cohesive argument (Biggs & Collis, 1982).

6.7 Results of the Student Surveys

All speech pathology students and psychology students in the experimental group were asked to complete a five question survey to evaluate the usefulness of the OLM as a learning resource. The number of experimental psychology student responses was higher in this section of the research because some of the psychology students who completed this survey did not submit their responses to the OLM questions and/or complete the post-test. Given that responses and test results were anonymous it was not possible to differentiate between these students’ responses and the responses of other students, so they have remained in the data.
There was a high level of support for the usefulness of the online learning module as a learning resource from psychology students (n= 27, Strongly Disagree 0%, Disagree 7.41%, Neither Agree or Disagree 18.52%, Agree 51.85%, Strongly Agree 22.22%). There was a higher level of support for the learning module from the speech pathology students (n= 37, Strongly Disagree 0%, Disagree 0%, Neither Agree or Disagree 16.22%, Agree 67.57%, Strongly Agree 16.22%). Results are summarised in Figure 23.

![Figure 23: Psychology and speech pathology students' perceptions of the usefulness of the learning module as a learning resource](chart)

Note: SD (Strongly Disagree), D (Disagree), N (Neither Agree or Disagree), A (Agree) SA (Strongly Agree)

When asked whether the use of case studies enhanced learning, there was strong agreement from the psychology students that the inclusion of case studies was beneficial (n=27, Strongly Disagree 0%, Disagree 7.41%, Neither Agree or Disagree 7.41%, Agree 44.44%, Strongly Agree 40.74%). Similar responses were obtained from the speech pathology students (n=37, Strongly Disagree 0%, Disagree 0%, Neither Agree or Disagree 13.51%, Agree 59.46, Strongly Agree 27.03). Results are summarised in Figure 24.
Students were also asked whether the OLM made learning about statistics more interesting. The majority of psychology students agreed (n=27, Strongly Disagree 0%, Disagree 3.70%, Neither Agree or Disagree 18.52%, Agree 44.44, Strongly Agree 33.33). In the case of the speech pathology students the majority of students also agreed (n=37, Strongly Disagree 0%, Disagree 5.41%, Neither Agree or Disagree 18.92%, Agree 43.24, Strongly Agree 32.43). Results are summarised in Figure 25.

Participants were also asked to comment on whether the OLM enhanced their understanding of statistical concepts and their relationship to test interpretation. For the psychology students there were mixed results, but the majority of students were positive about the contribution of the learning module to their learning (n=27, Strongly Disagree 0%, Disagree 11.11%, Neither Agree or Disagree 29.63, Agree 48.15, Strongly Agree 11.11). There were also
mixed results for speech pathology students, but the majority were positive about the
collection of the learning module to their learning (n=37, Strongly Disagree 0%, Disagree
16.22%, Neither Agree or Disagree 24.32, Agree 45.95, Strongly Agree 13.51). Results are
summarised in Figure 26.

![Figure 26: Psychology and speech pathology students' perceptions of whether the learning
module enhanced their understanding of how statistics relates to test interpretation.
Note: SD (Strongly Disagree), D (Disagree), N (Neither Agree or Disagree), A (Agree) SA (Strongly Agree)]

The final question asked students whether the OLM had assisted their understanding
of how index scores were used in test interpretation. Again the results showed a range of
opinions but the majority were positive (n=27, Strongly Disagree 0%, Disagree 22.22%, Neither
Agree or Disagree 14.82%, Agree 51.85%, Strongly Agree 11.11%). The results for the speech
pathology students were slightly more positive (n=37, Strongly Disagree 0%, Disagree 13.51%,
Neither Agree or Disagree 13.51%, Agree 48.65%, Strongly Agree 24.32). Results are
summarised in Figure 27.
6.8 Preliminary Discussion

This stage of the research examined how learning occurs in different contexts, and whether an OLM could assist students in applying psychometric knowledge to child language assessment, a core area of practice in speech pathology. This was a challenging test case of the importance of context in learning because psychology students and speech pathology students have very similar educational backgrounds in relation to psychometric knowledge in the early stages of their courses. A further difficulty was that students only had one opportunity to learn the information contained within the OLM prior to completing the post-test.

The assessment of psychology students aimed to simulate the learning experiences of students when they are enrolled in subjects taught by other disciplines. Exploration of how psychology students complete the tasks provides an insight into the type of knowledge that students can obtain when content is important for them to learn but the examples of how it is applied are not situated within their specific community of practice. Testing first year psychology students also provided a baseline for the amount of knowledge that could be obtained without having exposure to clinical placements and also as a pilot test to ensure that the pre and post-test had appropriate ceiling levels to capture future student progress. It was hypothesised that this learning activity would be more challenging for psychology students because it did not situate learning in an authentic psychology context. Results on the pre and post-test appeared to support this hypothesis, however, analysis of the short answer responses to the OLM questions which revealed better levels of performance in psychology students suggest
that learning and processes of transfer are far more complex and not an all-or-nothing phenomena.

Traditional theories of transfer involve a ‘common elements’ concept, whereby an individual recognises adequate similarity between the current situation and a previously experienced situation, enabling them to apply the previously acquired knowledge to a new situation. However, the problem of transfer goes beyond the individual; it is also a reflection of the cultural information an individual is exposed to, as this information has moderating influences on the classifying system or schemas developed by the individual (Pea, 1987). Korthagen and Kessels (1999) describe how the pervasiveness of socialisation may facilitate or hinder the transfer of knowledge in teacher education. University students have spent a considerable time in the education system as school students prior to beginning their tertiary education to become teachers. When they arrive at university they already have very strong preconceived ideas of the nature of teaching and learning, and these views can often be at odds with some of the content contained within formal academic teacher training. Interestingly, students’ preconceptions of teaching have been demonstrated to be a stronger influence on them than the new material that they are formally exposed to during their tertiary education (Korthagen & Kessels, 1999). Consequently, the problem of transfer can present as the inability of the student to integrate and reconcile their existing conceptions of teaching and learning with the knowledge presented through the teacher education program.

Both the speech pathology and the psychology students needed to transfer the information contained within the OLM to the more formal testing setting of the post-test. The psychometric calculations required to complete the case scenarios in the post-test were identical to the processes explained within the OLM. What differed was the more formal wording of the test questions and the multiple choice format of the post-test. This study was designed to reflect the traditional transfer methodology that Bransford and Schwartz (1999) describe as sequestered problem solving (SPS). These learning studies often take place under highly controlled experimental conditions where there is no opportunity for participants to look at other resources (people and information) or seek feedback, or revise their existing knowledge. They note that another key feature of these approaches is their emphasis on direct application through a final transfer task as their measurement of whether or not transfer has occurred. Results suggested that speech pathology students were more able to successfully apply their knowledge to the new testing context than the psychology students. Given that the control group of speech pathology students did not make significant improvements in their post-test performance suggests that the content in the OLM positively influenced performance, rather than familiarity with the test
questions (as the pre and post-test were identical) or general exposure to the speech pathology community of practice and/or involvement in other educational programs or settings.

From the perspective of the integrated learning framework, the psychology students were expected to have less learning resources available to them because they were being socialised in a task that was designed for speech pathologists. They were expected to have to make more use of constructivist approaches rather than processes of socialisation to support their learning. Speech pathology students had more opportunity to make use of existing knowledge, beliefs and greater familiarity with cultural tools such as standardised language assessments. It was expected that this would allow more efficient processing and a greater level assimilation of the material contained within the OLM and the individual’s existing knowledge for speech pathology students. The difference in performance between the psychology students and the speech pathology students on the post-test may be attributable to Billet’s (1998) concepts of near and far transfer. In this sociocultural perspective on transfer, knowledge is seen to be applied to new situations through abstraction of knowledge within a problem solving framework. Transfer of skills to similar situations (near transfer) is considered far more likely to occur than transfer across different communities of practice (far transfer). Knowledge is initially considered to be embedded within specific social situations. The ability to apply this knowledge in different settings is therefore dependent of the individual’s ability to reapply abstracted information, and the success of this is likely to be largely determined by whether the individual can perceive similarities between previous exposure to a situation and the current novel situation where a problem is presenting itself. For the psychology students who lacked the advantage of being taught skills within the context of psychology practice, there may have been an added cognitive load as information may have been more novel to them than the speech pathology students. When they then had to adapt the information they had acquired in the OLM to the more formal test-like structure, the degree of transfer was too much for them to successfully apply their new knowledge to the task. It is possible that psychology students would have performed better on the post-test if they had been given repeated exposure to the learning module prior to completing the post-test. Similarly, the gains in the speech pathology experimental group may have been larger if they had had the opportunity for more exposure to the content of the OLM.

Voss (1987) may also contribute to understanding the differences in performance between the psychology and speech pathology students. He describes learning as a pattern recognition process that minimises the processing effort required to come to a conclusion. Three possible processing scenarios have been outlined. In very simple, highly familiar scenarios, processing is highly efficient and automatic; formulating the answer requires a straight
representation of prior knowledge without need for modification (for example, naming a capital city). In the second scenario, an individual has some prior knowledge in the area, but has to transform existing knowledge in order to complete the task (for example reading a text passage and then transforming the information into a diagram). In the third scenario, the problem may represent an ill-defined complex problem. The presenting problem is unique, so the individual cannot draw on an existing framework; however, they can draw more broadly on their previous knowledge to develop a series of action steps or broad properties of specific situations that they have previously encountered to support their problem solving. Individuals use this knowledge to guide them in setting parameters, goals and a method of problem solving that will take them forward in resolving the unknown goal. The post-test may have represented a different level of processing task for the speech pathology and psychology students which may account for the differences in performance. For example, because the scenarios were represented in a speech pathology context, speech pathology students may have been faced with the second transfer scenario where they had some previously acquired knowledge and then had to learn and transfer the new knowledge contained within the OLM to the more formal post-test questions. This more closely reflects the scenario of applying previously acquired knowledge to a new clinical case – a skill that is essential for the development of client-centred practice. However, for the psychology students, the degree of processing required may have been greater and more akin to Voss’s (1987) third transfer scenario where the learner is faced with a more novel scenario, making it difficult for them to draw on existing knowledge or frameworks to transfer skills to a new setting. Success under this scenario requires individuals to draw on a much more general framework. This may not be efficient enough to assist on the post-test given the single exposure that students had to the learning materials.

Apart from the learning and processing load of being exposed to novel learning materials, there was another possibility that may account for differences in performance between the psychology and speech pathology students. It was hypothesised that the use of speech pathology case studies had the potential to impact on other aspects of the individual such as motivation and engagement due to the perceived relevance of learning resources. For information to be meaningful, students must grasp the importance of a piece of knowledge at the time it is presented to their practice. Without having faced a problem that highlights the usefulness of the new piece of knowledge, there is no motivation for the student to learn the information and integrate it into their existing knowledge. Korthagen and Kessels (1999) suggest that, when information is presented to students before they grasp its significance, it is likely to be resisted at the time of exposure and students also have a tendency to deny that they have been presented with that information on a previous occasion. Surprisingly from the survey results, it appeared that psychology students perceived the resources to be as engaging and
useful as their speech pathology peers, suggesting that other factors such as the processing load of learning and transfer were having a greater impact on results. In support of this, the psychology students also made detailed attempts to answer the OLM questions, and the time taken for students to complete the pre and post-tests online indicated that they were making a serious attempt at the task rather than rushing through to quickly receive course credit for participation. Therefore, it seems more likely that the differences in performance reflect the contextual (and hence learning and processing) differences of the tasks for psychology and speech pathology students rather than motivational factors. Further studies that ensure both groups complete the tasks in an identical classroom setting within a set timeframe would allow a more robust study design and reduce the impact of these issues as confounding variables.

The post-test aimed to test traditional concepts of learning and transfer; however, recently there has been a shift in emphasis to also examine transfer as a readiness to learn rather than an all-or-nothing phenomenon. In Chapter 2, a less prominent view of transfer that considers it as a facilitation of participant’s readiness to engage in further learning was explored. This approach is referred to as the ‘preparation for future learning’ (PFL) approach (Bransford & Schwartz, 1999), and is viewed as an additional rather than a competing view of how transfer of knowledge can be conceptualised and studied. In contrast to the traditional studies of transfer, the methodology of investigations into this type of transfer typically occur in settings where there are rich sources of knowledge available to participants, which greatly increases the compatibility of notions of transfer within a sociocultural approach. This approach looks at transfer from the perspective of how it impacts on future learning - the question of transfer changes from did transfer occur to how did learning one skill have an impact on the learning of a related skill. They suggest that when transfer is measured as an all-or-nothing issue, some positive signs of transfer can be missed, and consequently the potential for some kind of transfer to occur may be underestimated in traditional approaches to measuring transfer. All-or-nothing approaches may work well when studying experts but may not be adequately sensitive to depict smaller changes of development in the case of novices (Bransford & Schwartz, 1999). The psychology experimental group and all speech pathology students were asked to complete three OLM questions relating to the case study which aimed to enable assessment of transfer using a ‘preparation for future learning’ (PFL) approach (Bransford & Schwartz, 1999). Students were asked to complete the following questions:
• “What did your interpretation of Kylie’s test results reveal about her language skills?”
• “To what extent do you believe the assessment results provided an accurate picture of Kylie’s language skills? What else might you have liked to consider?”
• “Describe the factors that you believe might have impacted on Kylie’s language development.”

It was hypothesised that the speech pathology students would be able to answer the questions more effectively because they had a greater degree of relevance to speech pathology practice than psychology. Both content analysis and the SOLO taxonomy (Briggs & Collis, 1982) were applied to analyse the results. It was also hypothesised that the content of answers may differ between the speech pathology and psychology students because they belong to separate communities of practice which place different values and beliefs on the relative importance of different sources of information. Overall, when results were analysed using the SOLO taxonomy, there was a greater level of sophistication in the speech pathology responses when compared to those of the psychology students. This was characterised by a greater ability to integrate information from a number of sources within the OLM such as parent and teacher reports, file notes and standardised test results. There was also a greater ability to integrate and provide possible explanations for conflicting sources information such as differences in index scores and in some cases propose how these test results may manifest clinically. However, despite these differences, the psychology students made a good attempt at answering the questions and clearly demonstrated the ability to apply the information contained within the OLM to test interpretation using a speech pathology case example. This demonstration of learning provides support for the incorporation of a preparation for future learning approach as a more sensitive means of assessing the emerging transfer of clinical skills. The psychology students’ inability to make references to how a child might present clinically based on the test results is not surprising; it is likely to be attributed to differences in community of practice knowledge and consequently lack of opportunities to be exposed to how children with language disorders present clinically. The differences between the two groups in relation to the specificity of the descriptions of the test results were of interest, because all the information needed to describe these results was contained within the OLM resources. Despite this the psychology students had a greater tendency than the speech pathology students to report only the severe scores without reference to relative strengths in the test results.

The other unexpected finding was the high degree of similarity between content contained in speech pathology and psychology responses. This was not as surprising on some of the more prescriptive questions such as “What did your interpretation of Kylie’s test results reveal about her language skills?” which required students to analyse test data contained in the OLM. However, particularly in the case of the final question “Describe the factors that you
believe might have impacted on Kylie’s language development.” it was hypothesised that psychology and speech pathology students might identify quite different factors based their own community knowledge, beliefs and values relating to the relative importance of information. This was not the case, with both groups identifying the same top three factors (hearing/ear infections, starting school too early and the child’s emotional state). Consequently the results did not provide insights into the different socialisation of the two groups. Possible explanations are that the students in both groups are too similar in terms of sharing a common knowledge base in response to the question; or that they are not sufficiently advanced in their respective courses for the differentiations to be as apparent in the content of their responses as it was in their level of sophistication of responses as examined using the SOLO taxonomy.

It was hypothesised that speech pathology students would perform better on all tasks, based on the greater congruence of the learning materials with their community of practice. Whilst this general hypothesis is supported by the results, it is also interesting to note there was a difference in abilities displayed by both the speech pathology and psychology students on the learning module questions and the post-test. Both groups performed better on the open ended written response learning module questions relating to test interpretation, even though the same learning processes needed to be applied to the multiple choice questions, and information tables were laid out in the same format as contained within the learning module. Both groups found generalising their knowledge to the test format and more formal wording of the questions challenging. However, the speech pathology students still made significant gains in their ability to complete this task following exposure to the learning module whilst the psychology students did not. This suggests that transfer is not an all-or-nothing phenomenon and that the importance of being provided with learning materials that reflect the community of practice becomes more apparent when students have to then apply this new knowledge in less familiar learning contexts which require a greater level of generalisation or abstraction.

These findings suggest the underlying mechanisms behind the generalisation of learning are more complex than proposed by proponents of social learning theories. Identifying those situations where the use of authentic learning and assessment facilitates generalisation will greatly enhance the ability to marry social learning theory more harmoniously with principles of instructional design. In the next chapter the role of socialisation in learning and transfer are examined in more detail within learning environments that offer opportunities for collaborative learning.
Chapter 7: An Investigation into the Role of Interaction in Learning

The previous chapter explored the role of context in facilitating individual learning in two different activities along the authenticity continuum: learning when materials came from another discipline; and learning when materials were discipline specific. This chapter moves the research focus further across the authenticity spectrum towards a higher level of authenticity by allowing students to engage in interactive learning. The same Online Learning Module (OLM) and post-test was used. However, instead of being focused on the context of learning materials and the impact of context on self-directed learning, this chapter examines how people jointly engage in activities, and how this facilitates learning. In constructivist and sociocultural approaches to learning, opportunities to interact with peers and more experienced members of a community provide important facilitation of learning. From a constructivist perspective, problems or viewpoints that conflict with the learner’s own experience provide the necessary perturbations to challenge their existing schemas and prompt the restructuring of existing schemas or development of new schemas to accommodate this new knowledge. From a sociocultural perspective, the engagement in activities with members of the community provides opportunities for socialisation, as learners are supported to participate in the core activities utilising the tools, knowledge, and behaviours associated with the community of practice.

The research aim of this chapter was:

- To investigate learning interactions when more or less experienced individual students used the OLM with a clinical educator.

This chapter explores the role of interaction in learning through a naturalistic observational study of a clinical educator and three undergraduate speech pathology students at different stages in their degree working through the OLM and pre-test questions. Specifically, this research was concerned with examining how interaction supports learning and whether the nature of the interaction and scaffolding approaches differ depending on the level of experience of the student. Whilst this task was not taking place in the context of a clinic, it represented the most authentic task on the continuum of authenticity for an activity situated within a classroom. Given the greater level of authenticity and the presence of a clinical educator, it was hypothesised that there would be greater evidence of processes of socialisation mediating learning within this context. It was also hypothesised that the level of socialisation may be greater with more experienced students due to their greater level of exposure to core practices within the speech pathology community.
7.1 Participants

Three speech pathology students, (one second-year, third-year and fourth-year) were recruited to participate in this stage of the research. Each of the students volunteered to participate following a presentation at the end of speech pathology tutorials about the research. A clinical educator volunteered to participate in the research following an email sent out to all clinical educators working in paediatrics within the Newcastle, NSW area containing information about the research. The clinical educator involved in this research was highly experienced, and at the time of the study, was employed as a clinical educator within a student unit.

7.2 Methodology

Each speech pathology student completed the OLM, OLM questions and pre-test with the clinical educator. The same clinical educator completed the tasks with all three students and the order that the clinical educator completed the sessions with students was randomly assigned. To ensure the consistency of sessions between students, each pair of participants were given a maximum period of one hour in which to complete the tasks. The sessions took place in a quiet clinic room at The University of Newcastle, NSW. Participants were provided with pens, paper, a computer with the OLM loaded on it, and a paper copy of the OLM questions and the pre-test. Participants were provided with instructions on how to navigate around the OLM, answer the three online learning module questions and then complete the pre-test. In the interest of making the observations as naturalistic as possible, participants were not given any further instructions or feedback on how they should approach the tasks.

7.3 Data Collection

Each session was video and audio recorded to allow accurate transcription of conversations occurring between the student and the clinical educator. Following a review of the recordings, it was clear that the different levels of experience of students resulted in the learning materials and subsequent tasks being covered at a different pace. The second-year student had not completed the pre-test at the conclusion of the allocated time. Consequently for consistency across each pair, data analysis commenced at the beginning of discussion of the OLM and was concluded after participants had completed the first case study in the pre-test which consisted of questions 1-10.
### 7.4 Data Analysis

Each session was transcribed and then analysed using an exploratory theme-based analysis. Each response was coded multiple times to reflect the variety of themes contained within the response. Results were analysed using NVivo qualitative data analysis software version 7 (QSR International, 2006). The collaborative nature of learning was also analysed using exchange structure analysis which is a form of interpersonal analysis in systemic functional linguistics. Coding of responses followed the methodology outlined by Togher (1998). This analysis structure has been used to examine discourse with clients with communication disorders such as acquired brain injury (Togher, Hand, & Code, 1997). It provides a useful framework to analyse how much each conversation partner is taking a primary or secondary role in conversations. The analysis was considered particularly useful for this research because of its capacity to demonstrate the primary knower and secondary knower in discourse. Understanding which communication partner dominates the conversational exchange provides a good methodology for determining the degree of autonomy the student clinician has in performing specific speech pathology tasks, and thus determining their degree of participation within the presented activities. Consequently it may provide a sensitive means of plotting student progress along the continuum of legitimate peripheral participation. In this continuum students are engaged in authentic (legitimate) core practices in the community. Initially the student may take on a passive role (peripheral) such as observing other members in the community. As knowledge increases, the student gradually takes on more active roles within the community of practice (participation) (Lave & Wenger, 1991). In Chapter 1 it was proposed that the concept of legitimate peripheral participation may fit well with Anderson’s (1988) continuum of supervision. In the early stage, the evaluation feedback stage, the supervisor takes a very active role using a direct style of supervision while the supervisee has a passive role in the process. As the supervisee’s skills and experience develop they move into the transitional stage of supervision. At this stage the supervision style moves to a more collaborative interaction, with the supervisee increasing their level of active involvement in joint problem solving. The supervisor’s role reduces as the supervisee’s competency and contributions to the process increase. At the end of this stage when the supervisee is directing the majority of supervision the supervisee moves to the self-supervision stage where the supervisee has the skills to take responsibility for their own lifelong learning. Supervisees are now expected to have reached a level of competency where they can engage in self-reflection about their own performance. The power balance between the supervisor and supervisee has also shifted so that the relationship is a more equal and collegial relationship. Support is in the form of consultancy at this stage.
7.5 Results

7.5.1 The Online Learning Module

Table 15 contains a summary of the clinical educator’s actions during the discussion surrounding the OLM questions. A category analysis was used to describe the different actions of the clinical educator. In most cases the clinical educator’s actions did not vary greatly depending on the level of experience of the student. There was a slight increase in the number of general questions the clinical educator asked the second-year (6.32%) and third-year (6.74%) when compared with the fourth-year student (2.35%). This appeared to be due to the clinical educator’s greater need to seek information about the less experienced student’s knowledge base and clinical experience to target teaching to student strengths and weaknesses. The other noticeable difference was that the frequency of teaching questions was higher for the second-year student (7.47%) when compared to the third-year student (2.25%) and fourth-year student (1.18%).

Table 15: Relationship between clinical educator actions and student level of experience

<table>
<thead>
<tr>
<th>CE Action</th>
<th>2nd Yr .......... %</th>
<th>3rd Yr .......... %</th>
<th>4th Yr .......... %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarification</td>
<td>2 .............. 1.15</td>
<td>1 ................ 1.12</td>
<td>1 ................ 1.18</td>
</tr>
<tr>
<td>Correction</td>
<td>0 .............. 0.00</td>
<td>0 ................ 0.00</td>
<td>0 .............. 0.00</td>
</tr>
<tr>
<td>Direction</td>
<td>5 .............. 2.87</td>
<td>4 ................ 4.49</td>
<td>4 ................ 4.71</td>
</tr>
<tr>
<td>Nonverbal</td>
<td>0 .............. 0.00</td>
<td>1 ................ 1.12</td>
<td>1 ................ 1.18</td>
</tr>
<tr>
<td>Not Sure</td>
<td>0 .............. 0.00</td>
<td>1 ................ 1.12</td>
<td>0 .............. 0.00</td>
</tr>
<tr>
<td>Paraphrase Question</td>
<td>1 .............. 0.57</td>
<td>0 ................ 0.00</td>
<td>0 .............. 0.00</td>
</tr>
<tr>
<td>CE Prompts</td>
<td>1 .............. 0.57</td>
<td>0 ................ 0.00</td>
<td>0 .............. 0.00</td>
</tr>
<tr>
<td>CE Question</td>
<td>11 .............. 6.32</td>
<td>6 ................ 6.74</td>
<td>2 .............. 2.35</td>
</tr>
<tr>
<td>CE Statement</td>
<td>105 .............. 60.34</td>
<td>52 ................ 58.43</td>
<td>57 .............. 67.06</td>
</tr>
<tr>
<td>CE Teaching Question</td>
<td>13 .............. 7.47</td>
<td>2 ................ 2.25</td>
<td>1 ................ 1.18</td>
</tr>
<tr>
<td>CE Verbal Agreement</td>
<td>36 .............. 20.69</td>
<td>22 ................ 24.72</td>
<td>19 .............. 22.35</td>
</tr>
<tr>
<td>Total</td>
<td>174</td>
<td>89</td>
<td>85</td>
</tr>
</tbody>
</table>
Statements were the most prevalent form of clinical educator interaction in conversational exchanges. The clinical educator’s statements had a number of functions within the exchanges. Explanations were the most common type of statements. The other key functions are outlined in the table 16.

Table 16: Function of clinical educator's statements in online learning module

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explanation</td>
<td>“Yeah, so out of one thousand kids she’s number one.”</td>
</tr>
<tr>
<td>Terminology</td>
<td>“We use mild I don’t know what you guys have been taught....”</td>
</tr>
<tr>
<td>Subtle clue to investigate sources further.</td>
<td>“The others [index scores] aren’t that great.”</td>
</tr>
<tr>
<td></td>
<td>“But [she] wouldn’t speak for fifteen minutes.”</td>
</tr>
<tr>
<td></td>
<td>“Preschoolers should be able to manage a water bottle.”</td>
</tr>
<tr>
<td>Overt statement to investigate further.</td>
<td>“Something’s not right here.”</td>
</tr>
<tr>
<td>General Comment Empathy</td>
<td>“It’s nice not to be severe all the time.”</td>
</tr>
<tr>
<td>Encouragement</td>
<td>“You can hold all this in your head.”</td>
</tr>
<tr>
<td></td>
<td>“You’ll be right.”</td>
</tr>
<tr>
<td>Scaffolding</td>
<td>“It gives you the options there.”</td>
</tr>
</tbody>
</table>
Table 17 summarises the student responses during the learning module tasks. The pattern of responses during the learning module task was very similar, particularly in the case of the third-year and fourth-year students. The second-year student’s turn in the conversation took the form of agreement with the clinical educator (45.03%) more frequently than the third-year (17.61%) and fourth-year (23.40%) students. The second-year student also asked less questions (5.26% compared with 11.27% and 9.93%) and made less statements (47.95% compared with 67.61% and 65.96%) than the third and fourth-year students respectively. This may be a reflection of both the limited experience of the second-year student and consequently the greater differences of power between the second-year student and the clinical educator. As in the case of the clinical educator, statements were the most prevalent student response. The most common purpose of the statements was to convey information.

Table 17: Relationship between student actions and student experience during online learning module

<table>
<thead>
<tr>
<th>Student Actions</th>
<th>2nd Yr ...............%</th>
<th>3rd Yr ...............%</th>
<th>4th Yr ...............%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement</td>
<td>77.................. 45.03</td>
<td>25.................. 17.61</td>
<td>33.................. 23.40</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>0 ................ 0.00</td>
<td>3 ................ 2.11</td>
<td>0 ................ 0.00</td>
</tr>
<tr>
<td>Paraphrase question</td>
<td>3.................. 1.75</td>
<td>2.................. 1.41</td>
<td>1.................. 0.71</td>
</tr>
<tr>
<td>Question</td>
<td>9.................. 5.26</td>
<td>16.................. 11.27</td>
<td>14.................. 9.93</td>
</tr>
<tr>
<td>Statement</td>
<td>82.................. 47.95</td>
<td>96.................. 67.61</td>
<td>93.................. 65.96</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>142</td>
<td>141</td>
</tr>
</tbody>
</table>
Other key functions of statements are outlined in Table 18.

Table 18: Function of students’ statements in the online learning module

<table>
<thead>
<tr>
<th>Function</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide Information</td>
<td>“So receptive is a relative strength compared with the other one.”</td>
</tr>
<tr>
<td>Computer Navigation Actions</td>
<td>“I’ll click on that one and see what happens.”</td>
</tr>
<tr>
<td>Comment on situation</td>
<td>“That’s not so good.”</td>
</tr>
<tr>
<td>Explanation</td>
<td>“I thought that was saying that this is how significant it is and then their significance level was like it’s 0.05 it’s over or under.”</td>
</tr>
<tr>
<td>General Comment Empathy</td>
<td>“I was like poor kid what if she wants some help.”</td>
</tr>
<tr>
<td>Hypothesising</td>
<td>“I wonder if they’ve had an assessment before there to build any sort of rapport because if it’s a first initial thing then she might just be you know scary new person.” “And yeah you kind of wonder if this giving minimal information is related to her just feeling really uncomfortable.”</td>
</tr>
<tr>
<td>Comment on resources</td>
<td>“That doesn’t look exciting.”</td>
</tr>
<tr>
<td></td>
<td>“More and more data.”</td>
</tr>
<tr>
<td>Student learning processes</td>
<td>“I sort of scan things.”</td>
</tr>
<tr>
<td>Thinking out loud</td>
<td>“So she’s at 87 plus or minus 3.”</td>
</tr>
<tr>
<td>Feelings</td>
<td>“I feel really silly not knowing about percentile rank.”</td>
</tr>
</tbody>
</table>

The majority of student questions were statements with rising intonation to seek confirmation of accuracy from the clinical educator. There were also a number of direct questions seeking information from the clinical educator. Other questions related to the pace that the student and clinical educator navigated around the learning module such as asking whether the clinical educator was ready to move onto the next room in the learning module.

In addition to the content analysis, the nature of communication exchanges was also examined to determine whether the type of exchange differed due to the level of experience of the student. The concept of exchanges is based on the assumption that the main purpose of interactions is to provide or give information (Togher, 1998). When examining a conversation, parts of the conversation can be broken into units of information called moves. Exchanges consist of a group of moves which either request or provide information or request or provide actions (Togher, 1998). Togher (1998) developed a set of possible exchange types which characterised exchanges according to synoptic moves which are concerned with information
(giving, receiving, requesting), and dynamic moves that help track or challenge information in the exchange. The final part of the classification concerns determining who the main information provider (primary knower) and receiver (secondary knower) are in each exchange. Of particular interest within this study were the patterns of the primary knower throughout communication exchanges. Within the communication exchanges the primary knower is designated by the abbreviation K1 and the secondary knower by the abbreviation K2.

Communication exchanges that represent requests for action are designated as A1 for the primary person and A2 for the secondary person involved in the exchange. In this thesis the primary units of analysis were information exchanges. Three types of communication exchanges were examined: the clinical educator as the primary knower, the clinical educator as delayed primary knower, and the student as primary knower. Delayed primary knower reflects a special case of being primary knower when the primary knower is functioning as a teacher to request information to test student knowledge. They are referred to as a delayed primary knower because they already know the information but delay imparting this knowledge until the student has first had an opportunity to formulate an answer. Delayed primary knower was designated by dK1. Examples of each type of exchange are outlined below. In each exchange the clinical educator is designated by a ‘C’ and the student by an ‘S’.

Example 1: Information Exchange with Clinical Educator Primary Knower.

In this example, the clinical educator is the person conveying the information so they are considered the primary knower (K1). The student in this case is receiving the information and so is referred to as the secondary knower (K2).

<table>
<thead>
<tr>
<th>K1 C:</th>
<th>So she’s 68 percent sure that her receptive language skills are actually between the 8th and the 23rd percentile.</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2 S:</td>
<td>Ok.</td>
</tr>
<tr>
<td>K1f C:</td>
<td>So if you were to get a higher confidence level they’d be further like apart. The more [pause] more certain you want to be about where she’s actually performing the wider the confidence intervals get so at 68% that’s about as close together as they can be but then you are only 2/3 sure.</td>
</tr>
<tr>
<td>K2f S:</td>
<td>True.</td>
</tr>
</tbody>
</table>

*K1f = Follow up move by primary knower. **K2f = Follow up move by secondary knower.
Example 2: Information Exchange with Clinical Educator Delayed Primary Knower

A special case of the primary knower occurs when the clinical educator asks a question to which they already know the answer. This is referred to as the delayed primary knower (dK1) and is mainly used as a teaching device. An example of this is illustrated below:

<table>
<thead>
<tr>
<th>dK1</th>
<th>C:</th>
<th>What are you seeing in that top table?</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2</td>
<td>S:</td>
<td>Okay it’s just um [pause] her standard scores?</td>
</tr>
<tr>
<td>K1f</td>
<td>C:</td>
<td>Mmm.</td>
</tr>
</tbody>
</table>

Example 3: Information Exchange with Student as Primary Knower

The roles of participants can vary throughout the conversation and are governed by which speaker has the information during each exchange. An example where the clinical educator is the secondary knower and the student is the primary knower is shown below:

<table>
<thead>
<tr>
<th>K2</th>
<th>C:</th>
<th>How’s your state?</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1</td>
<td>S:</td>
<td>[laughs] Er not so good.</td>
</tr>
</tbody>
</table>

Table 19 provides a summary of the type and frequency of exchanges that occurred during conversation between the clinical educator and students while completing the learning module section of the task. Overall, the results for the third-year and fourth-year student were very similar. The clinical educator had a more formal teaching role with the second-year student which was demonstrated by the greater frequency of delayed primary knower exchanges (15.48% compared with 3.28% and 3.92% for the third and fourth-year students respectively).

<table>
<thead>
<tr>
<th>Exchanges</th>
<th>2nd Yr ..........</th>
<th>3rd Yr ..........</th>
<th>4th Yr ..........</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE Primary Knower</td>
<td>41 ............</td>
<td>31 ............</td>
<td>23 ............</td>
</tr>
<tr>
<td>CE Delayed Primary Knower</td>
<td>13 ............</td>
<td>2 ............</td>
<td>2 ............</td>
</tr>
<tr>
<td>Student Primary Knower</td>
<td>30 ............</td>
<td>28 ............</td>
<td>26 ............</td>
</tr>
<tr>
<td>Total</td>
<td>84</td>
<td>61</td>
<td>51</td>
</tr>
</tbody>
</table>
7.5.2 Pre-test

Following completion of the learning module questions the clinical educator completed the first case study (questions 1-10) of the pre-test with the second, third and fourth-year students. Table 20 summarises the actions of the clinical educator during completion of this task.

Table 20: Relationship between clinical educator actions and student experience on pre-test

<table>
<thead>
<tr>
<th>CE actions</th>
<th>2nd Yr .............. %</th>
<th>3rd Yr .............. %</th>
<th>4th Yr .............. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarification</td>
<td>1.............. 0.88</td>
<td>1.............. 0.90</td>
<td>0.............. 0.00</td>
</tr>
<tr>
<td>Correction</td>
<td>3.............. 2.63</td>
<td>3.............. 2.70</td>
<td>4.............. 4.04</td>
</tr>
<tr>
<td>Direction</td>
<td>9.............. 7.89</td>
<td>4.............. 4.65</td>
<td>4.............. 4.04</td>
</tr>
<tr>
<td>Nonverbal</td>
<td>0.............. 0.00</td>
<td>1.............. 0.90</td>
<td>0.............. 0.00</td>
</tr>
<tr>
<td>Not Sure</td>
<td>0.............. 0.00</td>
<td>0.............. 0.00</td>
<td>0.............. 0.00</td>
</tr>
<tr>
<td>Paraphrase Question</td>
<td>1.............. 0.88</td>
<td>1.............. 0.90</td>
<td>0.............. 0.00</td>
</tr>
<tr>
<td>CE Prompts</td>
<td>0.............. 0.00</td>
<td>0.............. 0.00</td>
<td>0.............. 0.00</td>
</tr>
<tr>
<td>CE Question</td>
<td>9.............. 7.89</td>
<td>5.............. 4.50</td>
<td>3.............. 3.03</td>
</tr>
<tr>
<td>CE Statement</td>
<td>78.............. 68.42</td>
<td>69.............. 62.16</td>
<td>71.............. 71.72</td>
</tr>
<tr>
<td>CE Teaching Question</td>
<td>4.............. 3.51</td>
<td>8.............. 7.21</td>
<td>6.............. 6.06</td>
</tr>
<tr>
<td>CE Verbal Agreement</td>
<td>9.............. 7.89</td>
<td>19.............. 17.12</td>
<td>11.............. 11.11</td>
</tr>
<tr>
<td>Total</td>
<td>114</td>
<td>111</td>
<td>99</td>
</tr>
</tbody>
</table>

Results were more consistent across the students regardless of their level of experience on this task. There was a greater level of direction provided to the second-year student (7.89%) when compared to the third-year (4.65%) and fourth-year (4.04%) students. Again there were more questions directed towards the second-year student when compared to the third-year and fourth-year students. Further examination revealed that, as in the case of the OLM, these questions were often used to determine the familiarity of the student with the concepts contained within the learning materials. It was interesting to note that the clinical educator actually used fewer teaching questions in this task when working with the second-year student (3.51% compared with 7.21% for the third-year student and 6.06% for the fourth-year student). This may have reflected the challenging nature of the learning materials for a second-year student and hence the need for the clinical educator to take a greater role of providing information and directing the student rather than using requesting information as a teaching.
method with this student. This greater role of the clinical educator in facilitating discussion is also reflected in the lower frequency of clinical educator agreement when working with the second-year student (7.89% compared with 17.12% for the third-year and 11.11% for the fourth-year student). Statements were the most common action of the clinical educator and reflected the same information portrayed in the learning module task (see Table 16). The actions of the students during completion of the pre-test questionnaire were also examined and are summarised in Table 21.

Table 21: Relationship between student actions and level of students experience on the pre-test

<table>
<thead>
<tr>
<th>Student Action</th>
<th>2nd Yr ..........%</th>
<th>3rd Yr ..........%</th>
<th>4th Yr ..........%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement</td>
<td>57 ........... 45.24</td>
<td>43 ........ 18.07</td>
<td>35 ........... 23.81</td>
</tr>
<tr>
<td>Don’t know</td>
<td>1 ............. 0.79</td>
<td>8 ............ 3.36</td>
<td>0 ............. 0.00</td>
</tr>
<tr>
<td>Paraphrase Question</td>
<td>5 ............. 3.97</td>
<td>8 ............ 3.36</td>
<td>1 ............. 0.68</td>
</tr>
<tr>
<td>Question</td>
<td>5 ............. 3.97</td>
<td>35 ........ 14.71</td>
<td>23 ........... 15.65</td>
</tr>
<tr>
<td>Statement</td>
<td>58 ........... 46.03</td>
<td>144 ........ 60.51</td>
<td>88 ........... 59.86</td>
</tr>
<tr>
<td>Total</td>
<td>126</td>
<td>238</td>
<td>147</td>
</tr>
</tbody>
</table>

Examination of the results revealed a consistent pattern for both the third and fourth-year students. The second-year student had almost an equal proportion of agreements (45.24%) and statements (46.03%) as responses which contrasted with the third and fourth-year students who had a greater proportion of statements. The second-year student asked less questions (3.97%) than the third-year (14.71%) and fourth-year students (15.65%). Further examination revealed that the more experienced students asked questions relating the case study to their own experiences on clinical placement. Several explanations may account for the difference in frequency of questions. Firstly, the second-year student may not have gained sufficient clinical experience to relate the case studies to real life practice. Secondly, the material contained in the pre-test was new and therefore not adequately consolidated to allow the student to readily ask questions. Thirdly, the greater power difference between a second-year student and a clinical educator student may have made the student reluctant to ask questions.
When examining the nature of exchanges on the pre-test the proportion of exchanges was very similar for the third and fourth-year students. The second-year student had less exchanges as the primary knower (25%) when compared to the third (39.34%) and fourth (36.84%) year students. Table 22 summarises the results.

Table 22: Relationship between type of exchanges and student experience on the pre-test

<table>
<thead>
<tr>
<th>Exchanges Test</th>
<th>2nd Yr..........%</th>
<th>3rd Yr.............%</th>
<th>4th Yr .............%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE Primary Knower</td>
<td>31.............64.58</td>
<td>31.............50.82</td>
<td>30.............52.63</td>
</tr>
<tr>
<td>CE Delayed Primary Knower</td>
<td>5.............10.42</td>
<td>6.............9.84</td>
<td>6.............10.53</td>
</tr>
<tr>
<td>Student Primary Knower</td>
<td>12.............25.0</td>
<td>24.............39.34</td>
<td>21.............36.84</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
<td>61</td>
<td>57</td>
</tr>
</tbody>
</table>

7.5.3 Comparison of Online Learning Module and Pre-test Tasks

When comparing the clinical educator actions across tasks, there was an increase in the proportion of directions on the pre-test for the second-year student (7.89% compared with 2.87% when completing the OLM). The same pattern did not exist for the third and fourth-year students. However, there was a slight increase in the proportion of clinical educator statements on the pre-test when working with all three students. There was a decrease in the proportion of clinical educator agreement when working with all three students on the pre-test. A summary of these results is outlined in Table 23.
Table 23: Comparison of clinical educator actions in learning module & pre-test tasks

<table>
<thead>
<tr>
<th>CE Actions</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; Yr OLM ...... %</th>
<th>2&lt;sup&gt;nd&lt;/sup&gt; YR Test ...... %</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; Yr OLM ...... %</th>
<th>3&lt;sup&gt;rd&lt;/sup&gt; Yr Test ...... %</th>
<th>4&lt;sup&gt;th&lt;/sup&gt; Yr OLM ...... %</th>
<th>4&lt;sup&gt;th&lt;/sup&gt; Yr Test ...... %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clarification</td>
<td>2 ............ 1.15</td>
<td>1 ............ 0.88</td>
<td>1 ............ 1.12</td>
<td>1 ............ 0.90</td>
<td>1 ............ 1.18</td>
<td>0 ............ 0.00</td>
</tr>
<tr>
<td>Correction</td>
<td>0 ............ 0.00</td>
<td>3 ............ 2.63</td>
<td>0 ............ 0.00</td>
<td>3 ............ 2.70</td>
<td>0 ............ 0.00</td>
<td>4 ............ 4.04</td>
</tr>
<tr>
<td>Direction</td>
<td>5 ............ 2.87</td>
<td>9 ............ 7.89</td>
<td>4 ............ 4.49</td>
<td>4 ............ 4.65</td>
<td>4 ............ 4.71</td>
<td>4 ............ 4.04</td>
</tr>
<tr>
<td>Nonverbal</td>
<td>0 ............ 0.00</td>
<td>0 ............ 0.00</td>
<td>1 ............ 1.12</td>
<td>1 ............ 0.90</td>
<td>1 ............ 1.18</td>
<td>0 ............ 0.00</td>
</tr>
<tr>
<td>Not Sure</td>
<td>0 ............ 0.00</td>
<td>0 ............ 0.00</td>
<td>1 ............ 1.12</td>
<td>0 ............ 0.00</td>
<td>0 ............ 0.00</td>
<td>0 ............ 0.00</td>
</tr>
<tr>
<td>Paraphrase Question</td>
<td>1 ............ 0.57</td>
<td>1 ............ 0.88</td>
<td>0 ............ 0.00</td>
<td>1 ............ 0.90</td>
<td>0 ............ 0.00</td>
<td>0 ............ 0.00</td>
</tr>
<tr>
<td>CE Prompts</td>
<td>1 ............ 0.57</td>
<td>0 ............ 0.00</td>
<td>0 ............ 0.00</td>
<td>0 ............ 0.00</td>
<td>0 ............ 0.00</td>
<td>0 ............ 0.00</td>
</tr>
<tr>
<td>CE Question</td>
<td>11 ............ 6.32</td>
<td>9 ............ 7.89</td>
<td>6 ............ 6.74</td>
<td>5 ............ 4.50</td>
<td>2 ............ 2.35</td>
<td>3 ............ 3.03</td>
</tr>
<tr>
<td>CE Statement</td>
<td>105 ............ 60.34</td>
<td>78 ............ 68.42</td>
<td>52 ............ 58.43</td>
<td>69 ............ 62.16</td>
<td>57 ............ 67.06</td>
<td>71 ............ 71.72</td>
</tr>
<tr>
<td>CE Teaching Question</td>
<td>13 ............ 7.47</td>
<td>4 ............ 3.51</td>
<td>2 ............ 2.25</td>
<td>7 ............ 21.00</td>
<td>1 ............ 1.18</td>
<td>6 ............ 6.06</td>
</tr>
<tr>
<td>CE Verbal Agreement</td>
<td>36 ............ 20.69</td>
<td>9 ............ 7.89</td>
<td>22 ............ 24.72</td>
<td>19 ............ 17.12</td>
<td>19 ............ 22.35</td>
<td>11 ............ 11.11</td>
</tr>
<tr>
<td>Total</td>
<td>174</td>
<td>114</td>
<td>89</td>
<td>111</td>
<td>85</td>
<td>99</td>
</tr>
</tbody>
</table>

*Note: OLM (Online Learning module)*
Examination of student actions across the two tasks revealed a similar pattern of responses from all students regardless of the task. There was a general trend across all students to paraphrase more questions on the pre-test however, this was likely to be related to the higher frequency of questions (10 compared with 3) in this task. There was also a trend for the third-year and fourth-year students to ask more questions on the pre-test than the OLM task (third-year 14.71% compared with 11.27%; fourth-year 15.65% compared with 9.93%). There were two main types of questions that the students asked. The first type was to clarify or check their understanding of the psychometric principles embedded in the case study. The second type of questions related to how the psychometric principles contained in the pre-test were applied in real life clinical practice. These areas are examined in more detail in later sections focussing on the specific students. The second-year student demonstrated the opposite pattern, with a reduction in the number of questions asked when completing the pre-test (3.97% compared to 5.26%). A summary of the results is displayed in Table 24.
Table 24: Comparison of student actions in learning module & pre-test tasks

<table>
<thead>
<tr>
<th>Student Actions</th>
<th>2nd Yr OLM......%</th>
<th>2nd Yr Test......%</th>
<th>3rd Yr OLM......%</th>
<th>3rd Yr Test......%</th>
<th>4th Yr OLM......%</th>
<th>4th Yr Test......%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement</td>
<td>45.03</td>
<td>45.24</td>
<td>17.61</td>
<td>18.07</td>
<td>23.40</td>
<td>23.81</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>0.00</td>
<td>0.79</td>
<td>2.11</td>
<td>3.36</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Paraphrase Question</td>
<td>1.75</td>
<td>3.97</td>
<td>1.41</td>
<td>3.36</td>
<td>0.71</td>
<td>0.68</td>
</tr>
<tr>
<td>Question</td>
<td>5.26</td>
<td>3.97</td>
<td>11.27</td>
<td>14.71</td>
<td>9.93</td>
<td>15.65</td>
</tr>
<tr>
<td>Statement</td>
<td>47.95</td>
<td>46.03</td>
<td>67.61</td>
<td>60.51</td>
<td>65.96</td>
<td>59.86</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>126</td>
<td>142</td>
<td>238</td>
<td>141</td>
<td>147</td>
</tr>
</tbody>
</table>

*Note:* OLM (Online Learning module)

Table 25: Comparison of exchanges in learning module & pre-test tasks

<table>
<thead>
<tr>
<th>Exchanges</th>
<th>2nd Yr OLM......%</th>
<th>2nd Yr Test......%</th>
<th>3rd Yr OLM......%</th>
<th>3rd Yr Test......%</th>
<th>4th Yr OLM......%</th>
<th>4th Yr Test......%</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE Primary Knower</td>
<td>48.81</td>
<td>64.58</td>
<td>50.82</td>
<td>50.82</td>
<td>45.10</td>
<td>52.63</td>
</tr>
<tr>
<td>CE Delayed Primary Knower</td>
<td>15.48</td>
<td>10.42</td>
<td>3.28</td>
<td>9.84</td>
<td>3.92</td>
<td>10.53</td>
</tr>
<tr>
<td>Student Primary Knower</td>
<td>35.71</td>
<td>25.0</td>
<td>45.90</td>
<td>39.34</td>
<td>50.98</td>
<td>36.84</td>
</tr>
<tr>
<td>Total</td>
<td>84</td>
<td>48</td>
<td>61</td>
<td>61</td>
<td>51</td>
<td>57</td>
</tr>
</tbody>
</table>

*Note:* OLM (Online Learning module)
A comparison of the exchange patterns across tasks was also made. The results are summarised in Table 25. The proportion of exchanges where the clinical educator was the primary knower increased on the pre-test for both the second-year student (64.58% compared to 48.81%) and the fourth-year student (52.63% compared to 45.10%). However, the proportion remained stable for the third-year student (50.82% on both tasks). For both the third and fourth-year student there was an increase in delayed primary knower exchanges on the pre-test (third-year 9.84% compared to 3.28%; fourth-year 10.53% compared to 3.92%). There was a reduction in delayed primary knower responses in the case of the second-year student (10.42% compared to 15.48%) which may be attributable to the higher proportion of direction given by the clinical educator to this student during this task. There was an overall reduction in the proportion of exchanges where the student was primary knower during the pre-test regardless of the level of experience of the student (second-year 25.0% compared with 35.71%; third-year 39.34% compared with 45.90%; fourth-year 36.84% compared with 50.98%).
7.5.4 **Interaction between Clinical Educator and Students**

7.5.4.1 **Providing Scaffolding**

As expected, the second-year student required more support to complete the learning tasks than the more experienced third and fourth-year students. This was reflected in the relatively even distribution of student responses that were statements and agreements. There were several ways that the clinical educator scaffolded learning throughout the learning module and the pre-test questions. Examples included assisting with time management; developing a strategy to ensure the student acquired the information they needed efficiently to answer the OLM questions; and assisting the student by directing them to relevant sources of information:

---

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>K1</td>
<td>C:</td>
</tr>
<tr>
<td>K2</td>
<td>S:</td>
</tr>
</tbody>
</table>

...and...

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>K1</td>
<td>C:</td>
</tr>
<tr>
<td>K2</td>
<td>S:</td>
</tr>
</tbody>
</table>

...and...

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>dK1</td>
<td>C:</td>
</tr>
<tr>
<td>K1</td>
<td>C:</td>
</tr>
<tr>
<td>K2</td>
<td>S:</td>
</tr>
<tr>
<td>K2</td>
<td>S:</td>
</tr>
<tr>
<td>K1</td>
<td>C:</td>
</tr>
<tr>
<td>K2</td>
<td>S:</td>
</tr>
<tr>
<td>K1</td>
<td>C:</td>
</tr>
</tbody>
</table>
When discussion began on the pre-test questions, the clinical educator took an active role in supporting the student through the process of determining the answers to questions. The second-year student’s primary focus was the mechanical processes involved in deriving the answers. There were also references to the added complexity that the formalisation of the questions added to the task:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>K2 S:</td>
<td>Um percentile rank corresponding to Jenny’s language standard score range.</td>
</tr>
<tr>
<td>K2 S:</td>
<td>[pause] Percentile rank.</td>
</tr>
<tr>
<td>K1 C:</td>
<td>Now she’s just trying to be tricky.</td>
</tr>
<tr>
<td>K2 S:</td>
<td>Yeah so that would be&gt;</td>
</tr>
<tr>
<td>K2 S:</td>
<td>[pause] So plus minus 5?</td>
</tr>
<tr>
<td>K1 C:</td>
<td>I think you need to work basically you need to identify what the central score is.</td>
</tr>
<tr>
<td>K2 S:</td>
<td>Yeah.</td>
</tr>
<tr>
<td>K1 C:</td>
<td>What’s the confidence interval for the language standard score of 87?</td>
</tr>
<tr>
<td>K2 S:</td>
<td>19</td>
</tr>
<tr>
<td>K1 C:</td>
<td>19 so the plus or minus 5 applies to the standard score.</td>
</tr>
<tr>
<td>K2 S:</td>
<td>So it would be 14 and 27.</td>
</tr>
<tr>
<td>K1 C:</td>
<td>Yeah, well you said between 82 and 92 so if you find 92 and 82 on here.</td>
</tr>
<tr>
<td>K2 S:</td>
<td>Yeah.</td>
</tr>
<tr>
<td>K1 C:</td>
<td>And draw straight across.</td>
</tr>
<tr>
<td>K2 S:</td>
<td>Yeah there.</td>
</tr>
<tr>
<td>K1 C:</td>
<td>12.</td>
</tr>
<tr>
<td>K2 S:</td>
<td>12 and 27.</td>
</tr>
<tr>
<td>K1 C:</td>
<td>Oh 30.</td>
</tr>
<tr>
<td>K2 S:</td>
<td>Oh sorry 12 and 30 oh yeah.</td>
</tr>
<tr>
<td>K2 S:</td>
<td>Oh that’s how you do it.</td>
</tr>
</tbody>
</table>
There were also examples of the clinical educator assisting the second-year student to identify what information was relevant to solving a particular question:

<table>
<thead>
<tr>
<th>K1</th>
<th>C: You don’t need to worry about those sheets.</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2</td>
<td>S: Yeah.</td>
</tr>
<tr>
<td>K1f</td>
<td>C: You only need to worry about this table.</td>
</tr>
</tbody>
</table>

...and...

<table>
<thead>
<tr>
<th>K1</th>
<th>C: I don’t think you need to refer to any graphs on this one.</th>
</tr>
</thead>
<tbody>
<tr>
<td>K2</td>
<td>S: Yeah.</td>
</tr>
<tr>
<td>K1</td>
<td>C: It’s simply the wording that you’ve got to think of.</td>
</tr>
<tr>
<td>K1f</td>
<td>C: [pause] Maybe exclude ones.</td>
</tr>
</tbody>
</table>

The clinical educator made use of more teaching questions when exploring the content of the learning model than the pre-test questionnaire. Some questions were concerned with the level of experience of the student (for example, determining the student’s familiarity with the CELF 4). Other questions were typically delayed primary knower questions such as the example above. Given the limited clinical experience of a second-year student, many of the clinical educator’s statements were used to convey information that the student was not very familiar with.

<table>
<thead>
<tr>
<th>K2</th>
<th>C: Did you [pause] work with confidence intervals much on your previous?</th>
</tr>
</thead>
<tbody>
<tr>
<td>K1</td>
<td>S: [nonverbal response]</td>
</tr>
<tr>
<td>dK1</td>
<td>C: Do you understand what they are about or the &gt;</td>
</tr>
<tr>
<td>K2</td>
<td>S: (um) It’s just [pause] I’m guessing it’s the range like where the standard score is its plus minus 4 sort of the range.</td>
</tr>
<tr>
<td>K1</td>
<td>C: Yeah it’s a specific range to try and identify where the child is actually performing rather than what their particular score &lt;&gt; was.</td>
</tr>
<tr>
<td>K2</td>
<td>S: &lt;OK&gt;</td>
</tr>
</tbody>
</table>
However, even when the primary purpose was providing information, the impact of socialisation on how such information was applied in speech pathology practice was revealed. For example, explaining to the second-year student the more frequent application of the 90% confidence interval:

K1  C:  So she selected a 68% confidence level.
K2  S:  Yes.
K1  C:  That’s just as a general rule I pick the 90th.
K2  S:  Yes.
K1  C:  Because in the CELF 4 manual it’s bolded and um it’s so it’s easy to locate.
K2  S:  Yes.

In contrast to the second-year student, the third-year student took a more active role in the discussions from the beginning. The clinical educator also guided the third-year student at the commencement of the activity to consider the questions prior to navigating around the learning module:

K1  C:  Do you want to have a look at the questions first to <if you>
K2  S:  <That’s probably a good idea.>

The learning materials appeared to influence the nature of the discussion with the clinical educator. It was clear from the conversation, that the third-year student found the pre-test material more difficult than the OLM materials. Despite this, the conversation between the clinical educator and the third-year student was much more balanced, with each contributing to the discourse, rather than the less even teacher student interaction seen between the clinical educator and second-year student. This was particularly the case when answering the less formal OLM questions. In many cases, the clinical educator facilitated independent learning by confirming to the student that they were on the right track but not interrupting the student’s train of thought. At other times the clinical educator scaffolded learning, gently challenging the student’s reasoning by pointing out additional factors that might need to be considered:
K1 S: I wonder if they’ve had an assessment before there to build any sort of rapport because if it’s a first initial thing then she might just be you know scary new person.

K2 C: Mmmm

K1 S: But if she’s already had stuff before to like build up some rapport it might be that she’s got some pragmatic stuff going on.

K2 C: Yeah if she’s if she’s already supposedly comfortable.

K1 S: Yeah.

K1 C: But wouldn’t speak for fifteen minutes.

K2 S: Yeah.

K1 C: Something’s not right there.

K1 S: And then minimal eye contact and putting her head down on the table and sounds like she just wants to get out of there.

K2 C: Yeah.

K1 S: And yeah you kind of wonder if this giving minimal information is related to her just feeling really uncomfortable.

K2 C: Mmm so not possible for her to show her maximal skill.

K1 S: Yeah particularly in structure ‘cause in structure you want more stuff.

K1 S: So if she’s not giving very much at all it’s really hard to kind of assess her structure.

K2 C: That’s right.

Increases in clinical educator input seemed to correspond to a perceived increased difficulty of the test material compared to the OLM by both the clinical educator and the student, with both commenting on the questions being difficult. From the clinical educator’s perspective the complexity of the more formal wording appeared to be the main source of perceived difficulty which reflects the commonality of the underlying interpretation processes in both the OLM questions and the pre-test:

K1 C: You do understand that it’s just the wording it’s just the wording that’s confusing.
It was interesting to observe that even though the power balance was more even than in the interactions with the second-year student, the third-year student assumed that the clinical educator was more knowledgeable even in situations where they had the same level of familiarity with the resources highlighting the power dynamics within the clinical educator and student dyad:

K2 S: OK, do I just click on any door?
K1 C: Um I guess so.

From the start of the learning activities the clinical educator encouraged the fourth-year student to take a more active role in directing the activity:

A1 C: So you drive this and I'll <> be a resource.
A2 S: <Alright>

In contrast to the second and third-year students, the clinical educator did not suggest to the fourth-year student a strategy of reading the questions prior to navigating around the OLM. There was also evidence of a much more relaxed, even and collegial relationship with the fourth-year student sharing a joke with the clinical educator early on in the conversation:

K2 S: OK we’re just discussing?
K1 C: Discussing you can tell me the answers to them.
K1 S: OK.
K1 C: Not like a viva though.
K2 S: [laughs] So do you need names of people like Caroline Bowen?
bch C: [laughs]
K2 S: Or Paul or>
K1 C: Or ______ [unintelligible] come on!
K2 S: Or Owens or anything like that (um).
The fourth-year student played a much more dominant role in the conversation, providing and incorporating different information without prompting or scaffolding from the clinical educator. The responses were much more sophisticated including a possible explanation for the varied perceptions of language abilities that might occur in different contexts rather than drawing heavily on only one source of information:

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<td>K1 S:</td>
<td>Her receptive language if we start there&gt;</td>
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<tr>
<td>K1 S:</td>
<td>Her parents think that she understands them&gt;</td>
<td></td>
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<tr>
<td>K1 S:</td>
<td>But in a family environment&gt;</td>
<td></td>
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<tr>
<td>K1 S:</td>
<td>And when they’re probably not giving her complex things to do.</td>
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<tr>
<td>K1 S:</td>
<td>They’re probably only asking her to brush her teeth&gt;</td>
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<tr>
<td>K1 S:</td>
<td>And go to bed and things like that.</td>
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<tr>
<td>K1 S:</td>
<td>She’s according to them is OK&gt;</td>
<td></td>
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<tr>
<td>K1 S:</td>
<td>And that would show the borderline thing&gt;</td>
<td></td>
</tr>
<tr>
<td>K1 S:</td>
<td>But in class when it gets more complex&gt;</td>
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<tr>
<td>K1 S:</td>
<td>If there’s &lt;&gt; two or three steps she won’t be able to keep up.</td>
<td></td>
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<tr>
<td>K2 C:</td>
<td>&lt;She can’t keep up.&gt;</td>
<td></td>
</tr>
<tr>
<td>K2 C:</td>
<td>Mmmm.</td>
<td></td>
</tr>
<tr>
<td>K1 S:</td>
<td>(um) So that’s yeah.</td>
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In the case of the fourth-year student, there were examples of the student attempting to make links between prior clinical practice and the presenting case study. In most cases the clinical educator supported the student by creating comments that encouraged the links the student was making between prior cases and the presenting case:

K1 S: It could also be she has an older brother so it might be (a) if she’s been talked for a little as well.

K2 C: That self-fulfilling cycle of if you don’t talk I’ll talk for you so the child talks less.

K1 S: Mmm like that little girl I forget her name but when I was on clinic with you in second-year the little girl that came in with no name of anything.

K1 S: ‘Cause her Mum just said oh when her big sister is thirsty we just them both a drink so she never had to ask so she didn’t know what a drink or a cup was called.

K1 S: So I mean there could be something like that in it too.

K2 C: Absolutely.

There were also examples of the fourth-year student trying to reconcile differences between best practice and the realities of practice in the real world. The clinical educator’s role was to help support the student to understand the subtleties of how procedures are applied to practice and under what circumstances these practices are typically employed in a real clinical environment. This extract also provided insight into the different emphasis on teaching clinical skills of the clinical educator depending on the level of experience of the student clinician:

K2 S: Oh confidence intervals aren’t they?

K1 C: Mmm hmm.

K2 S: Do you fill those out on every CELF that you do?

K1 C: Yes [sheepish tone]

bch S: [laughs].

K1 C: (um) Department of Education doesn’t require them for their funding things.

K2 S: Mmmm

K1 C: And they’re not interested in them.

K1 C: The more numbers you put in the less <> people at school read them.

K2 S: <Mmm>

K2 S: Mmm
K1 C: So I try and put in the basic numbers unless there’s something that needs to be commented on.

K1 S: ‘Cause I was going to say the whole time I did _______ (clinical placement) we didn’t really (like) we never reported on them really.

K1 C: (If you have um yeah) I don’t know in the current manual it’s exactly the same but in her earlier one the CELF 3 if you’re you weren’t supposed to combine subtests [that] where the confidence intervals didn’t overlap into an index.

K2 S: Oh OK.

K1 C: So if you had one that was up here and the others down here you weren’t supposed to be able to combine them into an index.

K2 S: Oh.

K1 C: I don’t know if that’s true in the CELF 4 anymore.

K1 C: (Um) So sometimes if one was well out I’d go and check.

K2 S: Mmm

K1 C: Now just part of habit.

K2 S: OK.

K1 C: But (um) it’s not usually something>

K2 S: Mmm

K1 C: I make my students fill it out so that they can learn how to do it.

K2 S: Yeah with all the tables and things but yeah.

K1 C: Yeah.

K1 S: (we never) We didn’t really report on it.

K1 C: And to put it in a report>

K1 C: No, it just seems to confuse the issue when you want to say that they’re normal or they’re not normal or they really are going>

K1 S: Or same if you get someone who is like gets an 80 or something but their confidence interval puts them into a normal>

K1 S: And then you get the whole oh but they are normal>

K1 S: It’s like no but they are actually here.

K2 C: Exactly, yeah.

K1 S: That’s just the all-encompassing they’re in this range I’m confident but here is their score.

K2 C: That’s exactly right.

K1 C: So it can cause more issues than not.
K1  C:  So I prefer to give a point score and then describe the abilities and difficulties.
K2  S:  Yeah OK.

### 7.5.4.2 Student Attitudes Towards Psychometrics

All three students expressed a negative attitude towards statistics. The second-year student was the most adamant:

K1  S:  I hate statistics.
K2  C:  Mmm, It’s good practice.

From the third-year student’s perspective it seemed to be the large number of tables that needed to be navigated to determine the correct answers which also appeared overwhelming:

K1  S:  It’s all numbers and all data and data is not my not my favourite thing.

It was also clear that the statistics was not an area that the fourth-year student enjoyed:

K1  S:  I just remembered I don’t like statistics.

Conversation with the clinical educator and the third-year student again highlighted that the application of psychometrics to test interpretation is an area that students have difficulty with:

dK1  C:  Do you remember your percentile ranks and stuff?
K2  S:  [laughs] Not really.
K2  S:  [pause] A little bit. Are percentile ranks to do with like that level of um oh yeah percentile ranks are like where she’s at for her age sort of thing isn’t it?
K1  C:  In comparison yeah<> to other kids her age.
K2  S:  <yeah>
Again, applying psychometric principles to test interpretation was an area in which the fourth-year student was not competent:

K2 C: Do you remember your (um) statistics with your confidence intervals?
K1 S: Vaguely [laughs].
K2 C: So this is good revision this one.
K1 S: It is actually.

Sometimes the formal language within the pre-test questions added an extra layer of difficulty to the psychometric tasks. For example the use of the word ‘conservative’ in relationship to the most conservative estimate of a test score added complexity to the second-year student’s understanding of how to apply confidence intervals to test interpretation:

K1 C: (um) I guess if one is being conservative.
K2 S: Mmmm
K1 C: You’re trying to <> well yeah you could think you’re trying to restrict the numbers but you’re trying to minimise error.
K2 S: <To>
K2 S: Yep, OK.
K1 C: So if you were to set your confidence intervals very close together you’ve got a greater chance of error.
K2 S: Oh yeah.
K1 C: So the least the (the most) risky<> ones (are the ones) where you are very certain.
K2 S: <Yes>
K2 S: Yes.
K1 C: The most conservative being the opposite of risky
K2 S: Yeah.
K1 C: Would be the broadest possible confidence interval.
K1 S: Which is 95 percent in this case.
K1 S: So I would go for B.
K2 C: Yep.
The third-year also had difficulty with the concept of conservative in relation to confidence intervals:

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<td>K2</td>
<td>S:</td>
<td>OK, well, that’s not the most conservative is it?</td>
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<tr>
<td>K2</td>
<td>S:</td>
<td>68 percent.</td>
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<tr>
<td>K2</td>
<td>S:</td>
<td>Aren’t you more conservative if you want to be 95 percent?</td>
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<tr>
<td>K2</td>
<td>S:</td>
<td>Oh maybe.</td>
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<tr>
<td>K2</td>
<td>S:</td>
<td>I suppose 95 percent is like saying you are really confident isn’t it so that’s not being very conservative at all.</td>
</tr>
<tr>
<td>K2</td>
<td>S:</td>
<td>68% is being conservative.</td>
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<tr>
<td>K2</td>
<td>S:</td>
<td>Ah I can’t think logically today.</td>
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The fourth-year student also had difficulty with this task:

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<td>K1</td>
<td>C:</td>
<td>So if you’re being very conservative in your estimate&gt;</td>
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<tr>
<td>K2</td>
<td>S:</td>
<td>Yeah</td>
</tr>
<tr>
<td>K1</td>
<td>C:</td>
<td>You allow for a larger margin of error.</td>
</tr>
<tr>
<td>K2</td>
<td>S:</td>
<td>Oh OK so it’s that way.</td>
</tr>
<tr>
<td>K1</td>
<td>C:</td>
<td>So if I had to conservatively estimate the amount of concrete in that pillar&gt;</td>
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<tr>
<td>K2</td>
<td>S:</td>
<td>Yeah.</td>
</tr>
<tr>
<td>K1</td>
<td>C:</td>
<td>If I wasn’t being conservative I ’d say 12 tonne</td>
</tr>
<tr>
<td>K1</td>
<td>S:</td>
<td>So if I was being very conservative I’d say somewhere between 5 and 20 tonne.</td>
</tr>
<tr>
<td>K2</td>
<td>S:</td>
<td>Ok so if you’re being conservative and you’re taking in large gap so that you’d be right then it would be the 95 one to get in.</td>
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### 7.5.4.3 **Facilitating More Advanced Learning**

There were also examples of the clinical educator facilitating the second-year student to make the more advanced transition from focusing on the test scores and descriptors to taking a broader perspective of the assessment process, incorporating a more holistic assessment of the child in the case study and understanding what that type of language impairment would manifest as in real life interactions:
K2 C: Do you want to move onto question 2?
K1 S: Yep. To what extent do you believe these results provide an accurate picture of Kylie’s language skills? What else might you have liked to consider?
K1 S: CELF 4 is very comprehensive assessment.
K2 C: Yes.
K1 S: So>
K1 C: It sort of does cover most of the areas so [pause] in a very formal way.
K2 S: Yeah in a very formal way but>
K2 S: Maybe>
K2 S: If there’s another test like an informal assessment?
K2 S: And see yeah like the situation differences that>
K2 C: So looking at basically informal assessment?
K1 C: Which you don’t have to have an assessment for you can just go and>
K2 S: Exactly

…and…

K1 S: They don’t talk much about her physical (um) abilities.
K2 S: No, no.
K1 S: In general.
K1 C: But she did have>
K1 C: She was four and she had trouble opening her lunch and drink bottle.
K2 S: Yes
K1 C: Things like that.
K2 S: Yes, fine motor.
K1 C: Ah yeah, which is not speech at all so maybe it’s a more generalised type <> delay.
K2 S: Exactly.
K1 C: I think the content wasn’t as bad as the structure.
K2 S: Yeah.
K1 C: But they were still both bad.
K2 S: Yeah.
K2 C: And (she did) was she 67 like a moderate kind of?
K1 S: Yeah she was moderate for (um) [pause] content.
K2 C: Content.
K1 S: Yeah, and severe for structure.
K2 C: Mmm
dK1 C: What would you draw out of that though?
dK1 C: (From) what would you expect her to be worse at?
K2 S: (um) Language structure putting, yeah
K2 C: Things together?
K1 S: Yeah, exactly.
K1 C: Yeah as opposed to actually labeling items and>
K1 S: Yeah that would be Ok because single words and [pause] her receptive is better than her expressive so she>
K2 C: Yes.
K1 S: So she would be able to deal with single words
K1 C: She was (in) in the mild range there so she would be able to understand those things as well.
K2 S: Yeah so>
In contrast, to the second-year student, the third-year student spontaneously took a more holistic view of the assessment process than the second-year student:

K1 S: (um) Accurate picture of language skills [pause] and factors that might have impacted on Kylie’s language development.

K1 S: So if there’s other stuff going on and what’s the other things outside of the assessment stuff I s’pose.

K1 S: So what attention and stuff she might have maybe.

K2 C: Mmm yeah.

Extension of the third-year student involved challenging the student to consider interpretations in relation to how decisions would typically be made in real-life practice. It was interesting that the strategy selected by the clinical educator to answer the question strongly related to the diagnostic clinical practices of their workplace rather than purer psychometric rationales, which would suggest the application of confidence intervals was the appropriate response. This provides further support for how authentic practices within specific communities of practice influence clinical practice:

K2 S: Would you be going marginal average?

K2 S: Just because of that confidence interval thing?

K2 S: Or would you just say average because she’s in that for her score?

K2 S: Cause she’s 87 and 85 hits in the marginal thing.

K1 C: Well, I know what I’d be doing.

K2 S: OK.

K1 C: I’d be looking at this from a (service review) a service delivery perspective.

K2 S: OK.

K1 C: So if her standardised score is 87.

K2 S: Yeah.

dK1 C: Which puts her on what percentile rank?

K2 S: 19.

K1 C: I’d be saying this child is normal.

K2 S: Normal, OK.
Nonverbal responses by the clinical educator played an important role in learning exchanges. Good natured laughing was the most common of these and it provided a non-confrontational way for the clinical educator to signal to the student to check the congruence of her response:

K1 C: Yes it’s actually out of the severe range which is>
K2 S: Good.
K1 C: Yeah, it’s nice not to be severe all the time.
K2 S: Yep, and to be good at something. [Laughs]
K1 C: [Laughs]
K2 S: Or to be better at something [laughs] –probably more to the point

A similar approach was taken during discussions with the fourth-year student:

dK1 C: Are you going to offer therapy for a child who’s scoring across the board at the 20th percentile?
K2 S: No.
K1 C: You’re going to say that there’s>
K2 S: I’m going to say that she’s average then and not>
K1 C: Yeah because there’s lots of other kids in that class that you want to work with.
K2 S: Will need it.
K2 S: Yeah.
7.5.4.4 Authenticity of Cases

There was also evidence to suggest that, although the presentation of cases was static, the cases were realistic enough that participants were able to develop empathy for the child in the case study:

| K1  | C:  | Terrible to think that she'd spent 2 ½ years in school before people started thinking they needed to refer her to> |
| K2  | S:  | Yeah. |

Working through the case studies with the clinical educator also allowed opportunities for the student to learn about the general practices out in real life clinical practice:

| K1  | C:  | Usually kids like that will get picked up in the year of starting school or even before. |
| K1  | C:  | I refer them to the school counsellors before they go to school. |
| K2  | S:  | OK. |
| K1  | C:  | So> |
| K2  | S:  | Yeah that just didn’t seem to happen to her. |

There was also one conversational exchange concerning the authenticity of the information contained within the learning module questions. The comments from both the third-year student and the clinical educator reflected the general comments contained within the clinical educator survey evaluating the learning module questions:

| K1  | C:  | I’m just imagining being a Dad and actually (and actually) having to remember that much detail of my children’s development. |
| K2  | S:  | Yeah it was like her language appears to have improved since they had grommets to ventilate – I was like wow I didn’t know that much about grommets myself. |
However, despite this there was evidence to suggest that both the clinical educator and the students were fully engaged in the case study within the learning module and the post-test questions. There were several comments reflecting empathy for the child in the case studies contained in both the learning module task and the post-test:

K1 C: Terrible to think that she’d spent 2 ½ years in school before people started thinking they needed to refer her to

[Clinical educator discussing learning module case with second-year student.]

...and…

K1 S: I was like poor kid what if she wants some help.

[Third-year student comment in relation to post-test case].

...and…

K1 S: She obviously is quite self-conscious when she is talking.

K1 S: (um) So yeah that would contribute to whether she’s not saying because she doesn’t know or not saying because she’s scared to give it a go.

[Fourth-year student discussing the learning module case with the clinical educator.]

The level of engagement with the materials also reinforced the previous results from the survey of clinical educators that materials such as video and audio recordings are not needed to create a sense of authenticity and engagement in learning materials.

### 7.7 Preliminary Discussion

This chapter has examined how interaction influences learning for speech pathology students at different stages in their degree when presented with two different tasks to work through with the support of a clinical educator. The context of the resources influenced the relative difficulty of the tasks, which, in turn, influenced the degree of support students required from the clinical educator in order to complete the learning tasks. This was particularly true in the case of the second-year speech pathology student who required more support to complete the pre-test task in comparison to the OLM questions.
All three students found statistics and psychometrics difficult which concurs with the mathematics literature, which has revealed that the abstract nature of these disciplines can be a barrier to student learning (Hiebert, et al., 1996). The degree of formality of resources also influenced the independence of students. The more formal language associated with the pre-test appeared to make the task more difficult for students, even though the underlying calculations that needed to be performed by the students were similar.

Interactions with the students revealed a progression in learning and subsequent adaption in the teaching content. For the second-year student, emphasis was placed on learning the mechanical processes associated with test interpretation. Extension of learning activities involved developing an understanding of how test findings would be manifested in everyday life and early attempts to combine formal assessment with other sources of data. For the third-year student, the emphasis was on learning how to integrate knowledge from a variety of sources and account for perceived differences within this information. In the case of the fourth-year student, there was evidence of a greater capacity for the abstraction and application of knowledge. Learning focused on identifying how previously acquired knowledge on clinical placements related to the presenting case studies. There was also a shift in the student from simply learning clinical processes associated with test interpretation to developing a real world understanding of what constitutes best practice in relation to the application of psychometrics to specific contexts, and an attempt to reconcile best practice and the realities of real practice. These transitions had strong parallels with O’Neill’s (1995) stages of test interpretation. Comparison of the types of interactions between the students and the clinical educator also demonstrated a gradual change from student and teacher roles to a more collegial relationship as described by Anderson (1988). This was most evident when comparing the second-year student with the third and fourth-year students. The difference between the supervisory style between the third-year and fourth-year students was less marked, although the content of the fourth-year student’s responses were generally more sophisticated than the third-year student.

This study provided insights into how the process of socialisation assists students to learn. The process described in these findings had similar parallels with the concepts of legitimate peripheral participation (Lave & Wenger, 1991). For the second-year student who was relatively new to the process of test interpretation, learning involved engaging in authentic test interpretation activities; however, a specific aspect of the task, the mechanical process of test interpretation was emphasised as the student’s role in the activity. The clinical educator socialised the student in more advanced aspects of the assessment process by assisting the student to consider other forms of assessment such as informal assessment as future adjuncts to the assessment process, which would need to be mastered for completeness of the assessment.
process. For the third-year student who was more proficient in the assessment process, the emphasis shifted from the mechanics of test interpretation to a more normative approach where the performance of the individual was examined both in relation to the population norms and the specific clinical eligibility for local clinical services. In the case of the fourth-year student, the transition in identity from student to beginning clinician was evident in the ability of the student to draw parallels between the presenting case and their previous clinical experience. The research also revealed the attempts of the student to reconcile the models of best practice presented academically with the realities of clinical application and the specific clinical and situational variances which may alter the manner of their application.

Discourse also provided some insights into the teaching methods of the clinical educator. It appeared that, even in highly situated learning environments such as on clinical placements, the clinical educator still incorporated elements of instructional design into teaching methods. For example instructing students to learn how to fill in the tables relating to the interpretation of confidence intervals, even though, in the clinical educator’s own clinical practice, this information was not routinely used except in those instances where discrepancies between subtests indicated the need for further exploration. Processes were learned first, and then the clinical judgment of when to apply these was learned later. This scenario also highlighted how tacit knowledge can be a considerable barrier for students, particularly if they do not ask clinical educators questions. For example, if the fourth-year student had not asked the clinical educator if confidence intervals were used, based on their clinical experience their perception may have remained that they were completed in the classroom but not applied in clinical practice. Although the clinical educator did not routinely overtly fill out the confidence intervals on test forms or include them in reports, the student may not have been aware that the clinical educator was automatically scanning the data each time to intuitively determine whether there was a degree of subtest discrepancy that would warrant further investigation and application of confidence intervals. The relationship of collaborative learning to the other elements of this research is explored in the following chapter.
"Artistry grows out of a way of knowing and seeing that is informed by theory, enabled by competence in action, and shaped by personal experience."

(Beeston & Higgs, 2001, p. 115)

It seems fitting to begin this final chapter with a return to the quote that commenced discussion of the complex nature of professional artistry in Chapter 1. The development of professional artistry is a multidimensional process that involves the integration of theoretical learning, practical learning and learning from past and present personal and clinical experience. Educational institutions foster the initial development of professional skills to a level which enables entry level competence, and sows the seeds for the future development of professional artistry. As new graduates enter the workforce, they must have developed a theoretical basis of knowledge and the practical knowledge and skills to be able to integrate and apply this knowledge to a range of clinical presentations. Development of a professional identity is essential to this learning process with new students being immersed and socialised within multiple communities of practice, both at the professional and organisational level. To draw on Dall’Alba’s (2009) terminology, learning to be a health professional is a process of ‘becoming’ that involves not just the acquisition of knowledge but the “embodiment of knowledge” (Dall'Alba & Barnacle, 2005, p. 719). This requires transformations which are shaped by both the learning processes and experiences of the individual, and socialisation through participation within the professional practices of the community. The challenges of learning and educational practice within these vocationally-orientated courses may more closely align with those faced by professionals in the workforce charged with the responsibility of developing and fostering professional artistry (albeit at the emerging level), than those of educators with traditional school-based views of educational pedagogy. Adoption of a view of education as the development of professional artistry to an entry level standard as the underlying goal of vocational courses opens up greater opportunity to take a more pluralistic approach to exploring the learning processes underpinning the development of professional artistry. Despite the critical importance of developing professional artistry for both students and practitioners, research into understanding the nature of the acquisition of professional artistry is still at an emerging level. Compounding this, many attempts to explore and understand these processes have been fragmented by divisions in research disciplines, their emphasis, and associated methodologies particularly between theories of learning, expertise and practice. In many cases
the role of socialisation has been neglected, with the effectiveness of the individual’s learning rather than the processes and contexts that shape this learning remaining the key research focus. This thesis proposes a dynamic view of learning as the development of professional artistry, embracing the concept of multiple complementary learning processes that combine to facilitate the development of an individual’s knowledge, practical skills and professional identity. Currently there is no single accepted theory of learning, expertise or practice which recognises the complexity and multifaceted nature of learning in general. It is unlikely that the development and synthesis of knowledge and clinical expertise necessary to become a competent member of a health professional community of practice can be fully captured within a single theoretical or methodological approach. In Chapter 1 it was argued that the development of professional artistry draws on elements of the theories of learning, expertise and practice, and that a dynamic framework which recognises the contribution of these different theories as complementary rather than competing, would provide the best framework for describing the learning processes facilitating the development of professional artistry. In order to make the transition from competing to complementary, several shifts in perspective are needed. Historically the process of learning has been polarised as a predominantly internal cognitive process engaged in by the individual, or as a predominantly social process occurring through participation in key elements of practice. Similarly, theories of expertise typically sought to make distinctions between novices, regular practitioners and experts within a field, without describing the nature of the transition between stages or processes that facilitate this development. In Chapter 2 an educational framework which recognised the complementary nature of constructivist and social learning processes in the development of professional artistry was proposed, with learning environments with a higher level of authenticity providing the greatest opportunities for processes of socialisation to facilitate learning. Reconceptualising learning as the development of professional artistry demands reflection on what learning really is, and equally importantly, what learning experiences should look like. Professional artistry demands not only the acquisition of knowledge, but the transformation and application of knowledge. Passing a linguistics or psychology course has little meaning in relation to the development of professional artistry if the student is unable to recognise the importance of such knowledge and the manner in which such knowledge must be applied in real life clinical practice. Given that it is not feasible for all knowledge generation to occur as on-the-job training, educators need to place greater emphasis on authentic learning and assessment, and re-evaluate the utility of traditional concepts of transfer as a benchmark for successful learning. To demonstrate how this need might be met, an Online Learning Module (OLM) was developed using contemporary instructional design principles to guide the development of authentic learning experiences within a situated learning framework. To explore clinicians’ perceptions of authenticity the OLM was evaluated by a group of practicing paediatric clinical educators.
Following this evaluation, emphasis in this research shifted to exploring how the authenticity of learning resources influences the learning of individuals. To assess this, two groups of students participated in the research: psychology students and speech pathology students. For the psychology students, the OLM represented a learning resource which taught them some fundamentals of applying psychometrics to child language assessment; however, the context presented these skills embedded within speech pathology clinical example rather than an example of psychology practice. Learning opportunities for these psychology students represented a similar situation posed by speech pathology students when attending lectures and tutorials taught by other disciplines. In contrast, for the speech pathology students, learning opportunities, whilst still representing a classroom-based learning task, had a greater degree of congruence with clinical practice, as theoretical and practice knowledge were embedded in an authentic speech pathology clinical case scenario. The final stage of this research aimed to explore the role of collaboration in developing professional artistry by exploring how speech pathology students at different stages of completion of their undergraduate degree interact with an experienced clinical educator to navigate through the OLM and associated tasks. In this final chapter some of the broad findings across these studies are explored with reference to key themes emerging from this study and the current literature. Implications for educators and further extensions of this research are discussed.

8.1 Summary of Key Findings

As is the case with most exploratory research, the findings of this research raise more questions than they answer. However, this thesis provides some preliminary insights into the nature of developing professional artistry and how these learning processes are influenced by the authenticity of the context of learning. It also provides insights into future methodology to expand existing research into the early stages of the development of professional artistry.

8.1.1 The Importance of Authenticity and Context in Learning

This thesis has argued that context plays a critical role in learning, by influencing the learning processes available to students, and the degree of transfer required for information to be applied to new contexts. Three important areas in relation to the role of context and authenticity in learning were explored in this thesis. Firstly, the challenge of how to develop authentic learning experiences which situate theory in practice in classroom environments was explored through a review of current literature relating to authenticity, and also through the practical application of developing an authentic OLM by incorporating principles of instructional design into a situated cognition framework. Secondly, the importance of context in learning was explored by examining how effectively psychology and speech pathology students
could participate in self-directed learning activities related to the OLM. Finally, insights into the nature of learning when students were provided with the opportunity of completing the OLM as collaborative task were explored.

When considering the proposed educational framework, the degree of authenticity was considered to be an important moderating factor of the relative dominance of learning loops available to students. However, despite the importance of authenticity in educational frameworks which draw on sociocultural theories of learning, literature describing the nature of authenticity and the components that are essential to integrate in educational experiences is relatively scarce. The questionnaire given to clinical educators to evaluate the authenticity of the OLM materials indicated that, when evaluating the authenticity of resources, clinical educators considered many of the factors present in both Guliker and colleagues’ (2004) and Herrington and Oliver’s (2000) authenticity frameworks. This study provides support for the utility of these frameworks as guides of how to incorporate authentic learning activities and outcomes in activities for speech pathology students. Such frameworks are likely to be useful guides for curriculum development across a range of disciplines including other health sciences.

In the educational framework proposed in this thesis, learning and the consequential development of professional artistry was guided by both individual constructivist approaches to learning and processes of socialisation through immersion within the community of practice. In contrast to many theoretical stances, within this educational framework these approaches were considered as complementary coexisting learning loops for students. The context of the learning experience was proposed to influence the relative dominance of each loop. In addition, the degree to which learning experiences reflected authentic practices of the community was proposed to influence the relative degree of difficulty of the task for students by decreasing or increasing the degree of transfer necessary to make salient links between prior knowledge and experience and the presenting learning experiences.

In order to explore the importance of context in learning, the psychology and speech pathology students were given the same tasks set within a speech pathology learning context. Both the experimental psychology group and the experimental speech pathology groups completed identical tasks related to the OLM, whilst the control groups completed only the pre and post-tests in addition to their regular university subjects. There was no significant difference in performance between the experimental and control groups of psychology students. In contrast, the experimental speech pathology students who were given the OLM performed significantly better than the control group. Both experimental groups had access to identical OLM resources, and yet only the speech pathology students were able to gain an advantage in performance on the post-test. Numerous factors may have contributed to this difference in
performance. The greater congruence of the task to real life practice for speech pathology students may have been more intrinsically motivating for students, and therefore may have fostered greater application to the learning tasks. Alternatively, the greater congruence of the tasks for speech pathology students may have lessened the learning load by presenting a more familiar scenario which enabled them to more readily recognise similarities with prior experiences. It is not possible from this research to conclusively demonstrate which factor(s) resulted in the difference in performance; however, what is clear is that the difference in learning context did have an effect on the effectiveness of learning between the two groups of students. Further research will be required to determine which factors have the greatest impact on performance. Despite the need for further research, these results suggest that context has a very important role to play in mediating successful learning especially in contexts where transfer of knowledge to new situations is required. Although there is a need to replicate these studies with a larger number of participants, this preliminary research suggests that educators need to recognise that the context of learning may have a considerable impact on the learning capacity of students. To assume that students will seamlessly learn, transfer and integrate knowledge from other disciplines into their own may be overly optimistic if they are not provided with explicit instruction that relates this knowledge to the context in which they are expected to apply it.

Classroom-based learning has often been criticised as being devoid of context although, in reality, it has its own context. However, such learning is often removed from the authentic activities of a specific field. Mercer (1992) suggests that this criticism stems from the more academic nature of such problems, that emphasises the cognitive rather than practical processes associated with problem solving. He suggests that context is actually just as important for students in these situations to successfully solve problems. In his view, academic success is defined by those students who are able to selectively apply contextual knowledge that facilitates their ability to solve problems, which has many parallels with the processes required for the successful development of professional artistry. When this view is taken, the focus shifts from viewing activities as contextualised or de-contextualised to exploring how students are able to re-contextualise academic problems in a manner that facilitates academic success. Context becomes a mental construct to some extent, where success is dependent on a student applying a relevant contextual and cultural framework to solve the presented abstract problem (Mercer, 1992). He suggests this perspective also requires a shift in teaching goals. Rather than determining what people know or can do through testing (outcomes), the focus becomes how much help people need to achieve these goals (process). He suggests that the best methodology to examine this is to look for how context is conveyed within teacher student interactions. He suggests that looking for examples of appropriation where teachers re-contextualise student
statements through techniques such as paraphrasing or constructively recapping context may provide insight into the extent that students are able to re-contextualise knowledge. An example of this was discussed in the Chapter 7 when the fourth-year student was trying to determine whether a child should be considered to have a borderline mild language disorder, or be considered average (depending on whether or not confidence intervals were applied to the child’s score). To help the student reach a solution, the clinical educator reconceptualised the dilemma into real clinical practice decision making, arguing that, in a community health setting, a child whose percentile rank was 19 would not typically be considered eligible for services, as the priority would be to see children with a greater level of impairment.

Competence may be moderated by context, and therefore differential performance on tasks in different contexts requiring the same underlying operations may be attributed more to how the context influences the way people think and approach a problem in a specific context, rather than as a measure of their underlying abilities within a field (Butterworth, 1992). These differences may occur even in cases where the steps and processes necessary to derive the solution in the different contexts are identical (Roazzi & Bryant, 1992). The individual’s perception of a situation is important, as this impacts on their referential framework when solving the problem. As Butterworth (1992) suggests, an important part of the context of learning is the manner in which culture is transmitted through discourse. The language used, perception, and attention, all serve to modify the referential framework of the individual engaged in the situation by modifying the thinking processes the individual applies to the problem. All of these factors may influence student performance and the degree of transfer of knowledge that may occur.

It could be tempting, based on the discussion so far, to form a view that a totally authentic learning environment is the best possible learning environment for students. However, quite apart from the feasibility issues, research in the area of learning simulations suggests that the relationship between authenticity and learning is complex. Alessi’s (1988) work on the impact of the fidelity (realism) of simulators (for example, flight simulators), suggests that the degree of authenticity of a learning environment can either hinder or enhance student learning depending on their level of experience. In particular there is an identifiable trend that suggests that, the more proficient a student is, the more they benefit from higher fidelity simulations because they have acquired the knowledge and automaticity which enables them to simultaneously learn from and process the complexity and greyness of decision processes in realistic simulations. In contrast, novice learners find that a simulation where they encounter too much complexity or realism, or response demands are too time critical which creates a cognitive load that is too high to enable effective learning. This seems evident in the level of
simplification and scaffolding of pre-test tasks by the clinical educator when completing the collaborative learning task with a less experienced student. The test interpretation task in the pre-test was simplified to the mechanical tasks of converting scores for the second-year student; however, both the third and fourth-year students were challenged to make decisions based not on numbers but on how those numbers related to clinical practice in terms of both eligibility for clinical services and how the presenting child’s abilities would place the child within the context of a typical range of abilities within a classroom. This practice reveals that clinical educators engaged in teaching in the field also employ elements of instructional design, and is not dissimilar to Lave and Wenger’s (1991) example of the step-by-step process of teaching tailors the various stages of making a suit, starting with the simple tasks such as sewing on buttons and gradually moving to more complex aspects of the task such as cutting out patterns.

Understanding how instruction naturally occurs in highly authentic learning settings is important for educators; as Alessi (1988) highlights this is a dilemma for educators, given that many instructional techniques work successfully within low fidelity frameworks, but also detract from the realism of the experience when educators are aiming to provide high fidelity learning experiences. More investigation is required to assist educators in embedding useful instructional support in high fidelity simulations in a manner that does not compromise the level of fidelity and/or the learning outcomes of students. Therefore, for educators, there is a need for further research to assist them in determining when learning situations demand high or low levels of fidelity; what the best instructional supports are to embed within these; and how to meet these needs in a cost effective and time efficient manner. To assume a linear relationship between positive learning outcomes and the level of fidelity and simulations is too simplistic (Alessi, 1988). Consequently he developed a taxonomy for characterising the fidelity of learning experiences for students which may assist with future research and development of learning experiences, specifically in relation to the design of computer-based learning simulations. He described four types of learning that could be assisted by computer based learning: physical simulations, process simulations, procedural simulations and situational simulations. Within each type of simulation there are four considerations: the underlying model of the simulation (objects and rules governing actions); the presentation of materials (visual, auditory, speed and timeframe of simulation); user actions (what students can do): and system feedback (type, timeframe and realism of feedback given to students). He proposed that the learning aims of the simulation will determine what aspects of the simulation require the greatest levels of fidelity to meet the learning goals. In the case of learning goals, fidelity is influenced by whether the goal is for students to learn about something or learn to do something. Essentially ‘learn about’ simulations involve physical and process simulations. Physical simulations teach students about physical objects and relationships between them (for example, Alessi (1988) discusses students learning about a satellite orbiting the earth). Process
simulations are concerned with ‘learning about’ too, but this type of learning involves invisible relationships (for example learning about evolution and genetics (Alessi, 1988). In these cases, he suggests that the underlying model of the simulation, and the presentation of materials, are the most important aspects to consider when examining the fidelity of the simulation design. In contrast, for simulations that aim to help students learn ‘how to do’ something, the level of fidelity of the user’s actions and the feedback given to students is more important. Procedural simulations attempt to teach students a discrete skill set, such as procedures for flying a plane, whereas situational simulations are more concerned with immersing a student within a setting, such as simulating teaching or running a business (Alessi, 1988). This framework may assist researchers and educators in further developing and testing online learning materials and determining which features of these environments are most critical with reference to the instructional goals and learning stages of students. Both procedural and situational simulations have considerable potential as learning tools to support the development of professional artistry, particularly when incorporated into classroom or clinic discussion to add the benefit of peer and collegial feedback. The context or fidelity of tasks does not just affect the transferability of skills, but also influences the expectations of the type of answers that are perceived to be socially acceptable by moderating the processes used to derive the answer and the nature of the answer given (Lave, 1992). This was also evident in the dilemma faced by the students in this research when working through the formal pre-test questions with the clinical educator. In one question the student was asked to determine the correct descriptor to describe the case study’s overall language score of 87. This question posed a challenge because, technically, there were two answers which could be perceived as correct depending on the reasoning processes. For the student, the correct answer to the problem depended on whether she applied pure academic psychometric principles associated with quoting a score range by using a confidence interval, or applied the practices she had commonly observed in speech pathology clinical practice, where clinicians have a tendency only to quote the obtained standard score unless differences between scores are significant. In this case another strategy emerged of trying to determine the researcher’s agenda to assist in clarifying the correct answer in the given context.

When discussing the use of word problems in teaching students mathematics, Lave (1992) suggests that, even when educators attempt to apply context to problems, there is a danger that the learner learns the technique of solving word problems, rather than identifying these as examples of how academic learning can be applied to real life problems. This is evident in the extracts from the second-year student, and is particularly the case when problems are heavily stylised, such as in the more formal genre of the pre-test. Lave (1992) suggests that whilst such word problems may serve as a means of motivating students by attempting to demonstrate the applicability of what they are learning to real life scenarios, the stylised nature
of such learning can lead to a compartmentalisation of values and knowledge, rather than a strengthening of links between learning problems and real life scenarios. This may explain the difference in performance of the psychology students between responses to the less formal short answer questions relating to the OLM and the more formal pre/post-test, despite both tasks requiring similar interpretive processes to be performed.

One of the dilemmas for schooling is that, in real life, people work at solving dilemmas in a way that minimises the effort (e.g. minimising calculations); however, in designing problems for students the goal may actually be the learning of the process of solving the problem, rather than the most efficient solution (Lave, 1992). This may also explain the differentiation in the clinical educator’s approach to answering the question depending on the level of experience of the student, and hence differences in learning goals in solving the presenting problem. Lave (1992) suggests that it is not the setting of the problem that is crucial, but rather it is whether the dilemma encountered by students is authentic. When professional practice is seen as contextually dependent, the implications go beyond the design of suitable curriculum resources. Context makes sense of practice for practitioners, and therefore highlights and organises the formation of professional skills and knowledge according to their importance and applicability within that specific working context (Dall'Alba & Sandberg, 2006). The next section explores how to promote transfer of skills within contexts and subsequent implications for assessment.

8.1.2 New Perspectives on Assessment and Transfer

There has been a great deal of debate on the role of context in learning, particularly in relation to the degree to which knowledge is transferrable between situations. This thesis takes the view that all knowledge is contextually situated; however, in some learning situations there is a greater level of cultural congruence for the learner than others. For educators the interesting question is not whether skills are transferable (since clearly in some situations they are), but understanding the processes that may facilitate or hamper the transfer of skills.

The transferability, or ability to re-contextualise knowledge, is known to be more difficult when individuals are presented with unfamiliar problems. Schliemann and Carraher (1992) devised a study of proportional reasoning of cooks in Brazil with very limited formal education that did not include the study of proportions. These cooks were given tasks in three different contexts that required them to find a missing value in proportionality problems. The three contexts were a sales transaction, a cooking context involving recipes, and a context of creating a pharmaceutical mixture. In the case of the sales transaction and the medicine problem, the answer needed to remain exact, whereas, in the case of recipes, approximations are
often socially acceptable. The authors hypothesised that the cooks may not be sure of how to treat the problems relating to medicines in relation to the degree of accuracy required. The cooks were divided into three groups which were presented with the three types of problems in different orders. The aim was to examine how transfer of information relating to the price problems occurred in other contexts. They found that solving unfamiliar problems (medicine problems) was facilitated by a specific order of task presentation: prices, recipes and then medicine problems however, there was less transfer when cooks were presented with prices and then medicine problems without the more familiar recipe problems in between. It appears that working through the more familiar recipe problems after the price problems that demanded exact answers allowed cooks to recognise patterns and similarities in the two tasks and develop a more precise manner of calculating proportions in the familiar activity of cooking. This familiarity then allowed them generalise this knowledge of how to calculate more precise proportions successfully to an unfamiliar medicine task (Schliemann & Carraher, 1992).

Greater familiarity with materials may also account for the speech pathology students’ better performance on both the OLM and pre and post-test materials than the psychology students. The degree of formality contained in the pre and post-test materials was harder than the OLM questions for all students; however, the greater familiarity of speech pathology students with the type of information contained within both the OLM and the test case scenarios may account for the significant difference in post-test performance between the psychology and speech pathology students. The congruence of their speech pathology cultural knowledge assisted them to more readily transfer and apply their existing knowledge to the more formal genre of the pre and post-test questions. This is particularly critical in tasks (like this) where learning is primarily an individual learning task which is supported only by prior learning and cultural tools, such as the information about practice contained within the learning module. In this sense learning becomes predominantly a process of internalisation, with limited opportunities for appropriation or socialisation to occur due to the lack of opportunities for interaction.

In this thesis, two views of transfer were explored: the traditional all-or-nothing approach to transfer which measures the learner’s application of knowledge to novel situations as a pass or fail; and the more contemporary conceptualisation of transfer as a more qualitative indicator of readiness for new learning. When performances between psychology and speech pathology students were compared using traditional notions of transfer, there was a significant difference between the psychology and speech pathology experimental groups’ ability to apply knowledge presented to them in the OLM to the post-test. However, when the performance of the two groups was compared on the short answer task, although the speech pathology students
in general presented more sophisticated responses, it was clear that the psychology students had been able to apply the knowledge contained within the OLM to respond to the short answer questions. This suggests that both the context of learning and assessment can have a considerable impact on student performance. It also lends support for greater emphasis on contemporary views of transfer as a qualitative change in readiness to perform new tasks. Such processes may allow more sensitive tracking of student progress, particularly in the very early stages of learning. An approach to transfer which measures qualitative changes in student readiness to engage in new tasks also demands the educators go beyond a checklist style approach of examining the presence or absence of particular skills and attributes, to taking a more in depth process analysis which aims to qualitatively describe and define the emergence and acquisition patterns of these skills. Implications for education in relation to this are explored in greater detail in the next section.

8.1.3 The Educational Framework

When developing the educational framework, an argument was made that there are contextual and cultural elements present in any learning task. Rather than polarising individual and social theories of learning, learning activities were seen as occurring on a continuum that was modified by the degree of authenticity of the learning task. In this educational framework, the emphasis is on describing and highlighting the multiple learning processes that contribute to the development of professional artistry. In particular, it challenges views that propose the dominance of a single learning process at the expense of all others, and highlights how the context of learning environments may impact on the types of learning processes available to students. Dall’Alba and Sandberg (2006) suggest that educational models that look at stages of development by comparing performance of practitioners or students at different levels of predetermined competence may miss important variations of practice within a given developmental stage. They discuss how the work of Benner (1984) and Benner and colleagues (1996) has been widely acclaimed as providing valuable insights into the nature of professional development through the application of a stage model to describe the characteristics of nursing practitioners at various developmental stages of professional artistry. Whilst they acknowledge that these studies provide valuable insights and descriptors of what competency may look like at each stage of development, they suggest that Benner and colleagues’ stage model shares the same criticism of other theories of expertise in terms of describing competency at a particular level without explicitly explaining the process of skill acquisition (Dall'Alba & Sandberg, 2006). Dall’Alba and Sandberg’s (2006) central criticism of these types of models is that professional development is broken down into a series of skills and attributes which are often decontextualised from the actual practice that they describe. They suggest that Benner’s (1984)
real contribution is the in-depth description of professional practice rather than her linking of this practice to particular stages of development. Dall’Alba and Sandberg (2006) propose that it is important not only to recognise skillful performance, but also to understand the processes that underlie acquisition. They suggest that, rather than looking towards stage models which decontextualise practice more research attention needs to be directed towards “understanding of, and in, practice” (Dall’Alba & Sandberg, 2006, p. 388). Understanding of practice must examine what they describe as “knowing, acting, and being” (Dall’Alba & Sandberg, 2006, p. 389). They suggest that to enhance our understanding of the development of professional practice, exploring variation within specific stages of development is just as important as characterising differences between these stages. The implication of this is that there is a need for ongoing exploratory research that aims to describe the transition of learning and the acquisition of skills within individuals as they develop, rather than describing generic skills sets at different cross-sections of development.

Dall’Alba and Sandberg (2006) propose that, in exploring the development of professional practice, longitudinal designs provide an advantage over cross-sectional designs because they enable the capture of general development and variations within individual development over time. The use of a longitudinal design, especially in the case of investigating the role of collaboration in learning, would be the methodology of choice for extending this current research and would provide greater insights into the development of professional artistry. Without employing this methodology they suggest that it cannot be assumed that the acquisition of professional practice involves a sequential or step-like progression in skills. In their longitudinal study of medical students Dall’Alba and Sandberg (2006) demonstrated that student’s initial understanding of their professional role profoundly influenced their ongoing understanding and application of professional practice both during and after the completion of their medical training. Identity and associated understanding of professional practice therefore had a powerful impact on patient care. This persistency of beliefs and identity was discussed in Chapter 1 with reference to education students whose own educational experiences as children continued to have a very robust influence on their perceptions, understanding of, and engagement in teaching practice, even in the face of conflicting evidence being presented in lectures and tutorials. Therefore, developing an understanding of student’s perceptions about and understanding of practice and how they develop as they are exposed to communities of practice may be as critical to educators as examining student performances on other assessment tasks. Dall’Alba and Sandberg (2006, p. 392) draw on the work of Heidegger to perceive the development of understanding as a circular process: “...we develop our understanding of something through our interpretation of it. Interpretation is a mode of understanding that clarifies what we have already understood.” This view of individual understanding being
moderated by experiences fits well with the loops in the educational framework (Figure 28) which characterise the joint roles of both individual and social processes of learning. Understanding of practice is a constantly evolving process, where individually constructed knowledge and understanding influences learning patterns, identity and meaning as much as the context of learning and the influence of socialisation.

Dall’Alba and Barnacle (2007, p. 682) also discuss the interdependency between knowledge and being:

Knowing or how we understand the world, thus arises on the cusp between the history of being – or how being has been thought in the past – and the possibilities of being that are opened up in our everyday practices, projects and activities.

From their perspective this means that the how and what of education are essentially the same thing. This suggests the importance of context in facilitating professional learning; however, the role of context has a complex relationship with learning with both Dall’Alba and Sandberg (2006) and Aleesi (1988) recognising the tendency for novices to gain more from traditional instruction and rules, while for more experienced practitioners, authentic context specific learning environments are more conducive to learning. Dall’Alba and Sandberg (2006) suggest that an area of research that has received little attention is how students make the transition from taking their rule-based and theory-based knowledge learnt in less authentic contexts, and then transform and integrate this knowledge with clinical practice. The OLM provides authentic situated learning experiences within a framework of instructional design and aims to provide an illustrative example of how to create an academic learning environment.
where students are encouraged to ‘become’ practitioners, but at the same time allows the complexity of the context to be moderated to a level which meets the cognitive demands of their current level of experience and also specific curriculum goals. Levels of complexity and realism can be increased progressively as student experience increases to facilitate the transition from classroom to clinical settings. Further research that examines and describes how students link content from other disciplines to the development of professional artistry as they are exposed to increasing levels of complexity and authenticity may provide important insights into these processes.

Adopting the proposed educational framework has the advantage that it emphasises learning processes rather than skill acquisition. This provides a platform to shift the focus of research to *how* students learn rather than the traditional emphasis on *what* students learn. Dall’Alba and Sandberg (2006) propose a process focussed framework for examining the development of professional skills. In their model they discuss horizontal and vertical dimensions of professional skill acquisition. The vertical plane of their model concerns the progressive development of what they term “skilled know-how” (p399) through experience derived from being progressively involved in clinical situations. However, unlike traditional stage models they do not maintain that this skill development necessarily increases as a linear progression as experience increases. They added a second vertical dimension to professional skill development which they describe as embodied understanding of practice. This new dimension is concerned with determining the student’s understanding of practice, and they propose that there are likely to be a limited set of ways that particular types of practice are both understood within the community and applied to practice. The advantage of examining both vertical and horizontal planes of development is that they allow a greater level of understanding of how professional knowledge develops, and the individual variation within it. For example, they suggest that some students and practitioners may progress along the horizontal skill pathway, developing considerable expertise within a specific context and/or role, without moving vertically towards a greater or new understanding of what broader practice really is. Dall’Alba and Stanberg (2006) suggest that differences in this understanding may also account for why some very competent practitioners remain at the competent level, whilst others continue to develop their skills to an expert level:

Integral to the notion of unfolding circularity is the possibility that current understanding can present obstacles to achieving more complex or comprehensive understanding. In such cases subsequent development consists of refinement of an existing understanding without the kind of transformation that would involve progression to more complex and comprehensive levels. (p. 396).
Dall’Alba and Stanberg’s (2006) framework allows for enhancing the understanding of what specific skills are and how they develop. They suggest that this requires educators to change their focus from traditional views of transfer which often assess decontextualised skills and knowledge to understanding how these develop actually in practice. They suggest that educational focus needs to shift towards determining how best to design learning experiences that challenge students’ current understanding. Critical to this process is examining how to make links between learning opportunities, and how to make these learning experiences relate to practice in more tangible ways to students. The proposed educational framework in this thesis draws educators’ attention to the context of learning and how this influences student learning processes. It also reveals that learning outside the context of clinical practice allows less opportunities for processes of socialisation to support general learning and learning in practice. Dall’Alba and Sandberg (2006, p. 402) highlight the need for educators to assess students’ “understanding of and in practice”. Differences in performance can be seen as differences in student recognition or understanding that either limit or enable an individual to apply their knowledge to a presenting situation. Therefore, the study of learning must be situational or context specific. Critical reflection on practice with peers may be a way of promoting a more synthesised and contextualised understanding of practice in the classroom.

To further develop the educational concepts explored in this thesis research is required that includes longitudinal designs which describe both student understanding and the learning processes that contribute to learning throughout their education. Only by gaining greater insight into the development of professional artistry will educators be able to determine what educational processes and contexts best facilitate development for individual students at different stages in their development. Limitations of the current study and directions for future development are explored in the following section.

8.2 Limitations of Current Study and Directions for Future Research

This thesis was exploratory in nature, and consequently the conclusions that can be confidently drawn from this research are limited. Research emphasis in this thesis was focussed on qualitative description of learning and practice. The proposed educational framework’s development was informed by current literature, and descriptive results appeared to provide some emerging support for the elements described within the framework; however, it has not yet been empirically supported by research specifically designed to assess its efficacy as a descriptive educational framework. Further research to examine the empirical basis of the framework will strengthen its utility as a guide for educators.
Despite the inability of this research to empirically determine the efficacy of the framework, the research raised some important preliminary findings in relation to how context and socialisation can impact on learning. In the case of the research comparing the speech pathology and psychology students, it was clear that there was a difference in performance between the psychology and speech pathology students’ ability to apply knowledge from the OLM to the post-test, when compared to their control groups. Unfortunately due to ongoing recruitment issues there was an unavoidable difference in methodology between the psychology and speech pathology students. The initial study design was for both the psychology and speech pathology students to access the OLM independently as a self-directed learning activity. However, due to considerable difficulty recruiting adequate numbers of speech pathology students, following ethics approval, an amendment to the research design was made which allowed speech pathology students to complete the OLM in class time in their computer laboratory tutorials, and then elect whether they gave consent for their data to be included in the research. This created another potential variable namely the context of student learning even though the learning materials and the sequence of tasks was identical. Fortunately, as exploratory research, the aim was to capture and describe learning processes rather than to determine the efficacy of the learning module. From that perspective any differences in performance, regardless of the reason, are interesting and warrant further investigation to inform educators of factors that facilitate or hinder learning.

Another limitation of the current research was that all students and clinical educators recruited for this research were affiliated with or enrolled at the University of Newcastle and consequently their views and performances within the studies may not be representative of the broader student and clinical educator population. This is not of great concern at such a preliminary stage of research; however, future research needs to broaden to include recruitment of students and clinical educators from a range of tertiary institutions to ensure that the findings are representative of the learning and educational needs of the broader population.

Other factors not explored in this study were the potential impact of learning preferences, previous computing experience and attitudes towards computers on student performance. One issue is the impact of gender on attitudes towards computer technology. There has been a strong gender bias reported throughout the 1980s and 1990s, with boys having far greater interaction and enjoyment of video games and computer technology than girls. This has led to differences in computer literacy between genders (Mackereth & Anderson, 2000). In the 1990s, girls perceived that videogames were more tailored and marketed to the interests of boys, and therefore many girls, particularly if they did not have male siblings, were less inclined to interact with these games. Mackereth and Anderson (2000) suggested that, as a consequence,
girls did not have as much early exposure to computer technology prior to commencing school and that this resulted in less positive attitudes towards learning computer skills. It would be interesting to determine whether the same trends are still present today, given the broader range of electronic games available, the greater integration of technology into everyday life, and the advent of social media such as Facebook and Twitter which may appeal more to girls, given the social nature of such media. Educators do, however, need to be mindful that female students may still be less confident and motivated to engage in game-like computer-based simulations than their male peers. This area is an important area for further research especially in the health professions given the fact that a high proportion of students are female. Other researchers have addressed this concern by administering the Rezler Learning Preference Inventory (LPI) (Rezler & Rezmovic, 1981), the Computer Attitude Survey (CAS) (Startsman & Robinson, 1972) and the Online Learning Environment Survey (OLES) (Trinidad, Aldridge, & Fraser, 2005) to students prior to commencing their study. This issue is becoming less critical in today’s highly technological world than it was even 10 or 15 years ago as many of the navigational features embedded in online learning environments are now commonplace and computer sites with social media such as Facebook have a strong female following. Any future research that aims to focus on the efficacy of online learning environments needs to account for the impact of attitudes towards technology as a potential influencing factor in learning success. This is particularly important given that computer-based technologies have enormous potential to complement and support existing learning opportunities. Multimedia creates interesting and engaging learning environments that can allow interactive learning and have the flexibility to cater for a range of learning styles (Okamoto & Hartley, 2002). Given that students will eventually work in multidisciplinary and interdisciplinary teams there is a need to provide students with opportunities to develop their ability to work in team settings. Part of this involves greater emphasis on providing opportunities for students to be exposed to multidisciplinary education (Cooksey, et al., 1995). Given the difficulties of coordinating students from multiple health professional courses, computer technology may assist in making this more logistically practical in academic environments. Multimedia also has the potential to assist students to access rare clinical presentations which they may not routinely have the opportunity to experience on clinical placements.

In the final section of this study a single case study design was used to examine interactions between a clinical educator when paired with a second, third and fourth-year student. The nature of a single case study design limits the extent to which the results can be generalised to the broader population without the study being replicated with larger student numbers from each year group. Development was also examined using a cross-sectional design which aimed to provide a snapshot of student learning at different levels of experience. Further
research utilising a longitudinal design process that aims to describe the development of professional artistry in individuals over time would make a valuable contribution for researchers and educators who wish to gain more in-depth insights into the processes which guide the development of professional artistry.

Developing insights into education necessitates some degree of abstraction and acknowledgement of a number of potential variables related to this even when efforts are made to limit them. This is described quite eloquently by Labaree (1998, p. 5) when he says:

[When conducting research into education] the impact of curriculum on teaching or teaching on learning is radically indirect because it relies on the cooperation of teachers and students whose goals, urges, and capacities play a large and indeterminate role in shaping the outcome.

8.3 Conclusion

The main aim of this thesis has been to reflect on and provide some guidance in relation to the challenging question of how to describe and facilitate the learning processes involved in the development of professional artistry, and to see this as a unique, dynamic and highly complex learning experience which draw on a range of internal and external learning processes which are mediated by the context of learning. Through the course of this thesis several questions have been raised and explored such as:

- What learning processes contribute to the development of professional artistry?
- What learning processes dominate in different settings?
- What is authenticity?
- How does context facilitate and hinder learning?
- What kind of educational framework may assist educators in helping students to develop professional artistry?
- What methodology will best capture the development of professional artistry?

In an exploratory thesis there is no possibility of providing definitive answers to any of these questions. In fact, as is often the case in new areas of research, the preliminary exploration has raised more questions than answers. The hope, though, is that the content of this thesis and its preliminary findings will question, challenge, and promote discussion and reflection about the nature of learning and development of professional artistry. Critical dialogue on these issues will spur the development and evaluation of new methodologies and educational frameworks to guide educators in facilitating the complex but rewarding task of sowing the seeds of professional artistry in our next generation of clinicians.
Appendix 1: The Online Learning Module

This appendix contains a complete set of printouts from the online learning module. Many of the examples provided in this appendix demonstrate the OLM when it is in tutorial mode which forces students to navigate through the OLM in a set order to ensure that they were aware of all the possible sources of information relating to the clinical case. Once students had completed the tutorial they were able to navigate freely around the OLM.
Hi you must be the new speech pathologist. Great to have you here.

Why don’t I start by giving you a tour.

Let’s start with your office. I’m going to show you a lot of things. You don’t need to read them all now, I just want to make sure you can find everything.

Click on the office door with the left mouse button.

Here’s your office. You can find information by clicking on the phone with the left button on your mouse.
Phone

- **Kylie’s Parents**
- **Kylie’s Teacher**

You can find out information by phoning and Kylie’s parents and teacher.

Move the mouse over Kylie’s Parents and click the left mouse button.

---

**Phonecall to Kylie’s Parents**

The following is an extract of a phonecall to Kylie’s father, John.

**Speech Pathologist:** Hi I’m _____ the speech pathologist at ______ Community Health Centre. I’m going to meet Kylie tomorrow. Do you have time to talk to me for a few minutes – I just want to get a bit of a picture of Kylie and an idea about her language development before I meet her tomorrow.

**John:** Yeah that’s fine. She’s always been a bit slow at putting words together. She’s improved heaps but she’s 7 and still sounds younger than her friends. My nephew is 5 and the way they talk is very similar. It would be good to know where she’s at and how to help her.
Speech Pathologist: I’m glad to hear that Kylie has had some benefits from grommets. From the sound of what you are saying Kylie has been a little slow at using language since she was a baby. From what you have told me so far it seems like the main area of concern is her spoken language. Do you have any other concerns?

John: No, it’s mostly her ability to express herself. She understands everything we say. I just worry about her keeping up in class and her ability to make friends when she finds it so difficult to have a conversation with people.

Speech Pathologist: I think it will be really good to look at what areas of language Kylie finds easy and what areas she finds a bit difficult. That way we will be able to build on Kylie’s strengths when developing strategies to help her in the classroom or when she is playing with friends.

I know you said that you are primarily concerned with her spoken language, however my suggestion would be to assess both her comprehension and her spoken language so that I have a really good idea of her overall language abilities. Does that sound OK to you? Do you have any questions?
John: That’s probably a good idea to look at all her language skills. I think just talking to you has answered some of my questions. I’ll see you tomorrow.

**PLAN:** Administer the CELF 4 to obtain an overview of Kylie’s language skills.

---

**Phone**

- Kylie’s Parents
- **Kylie’s Teacher**

Move the mouse over Kylie’s Teacher and click the left mouse button.
Phonecall to Kylie’s Teacher

The following is an extract of a phonecall to Kylie’s teacher, Ms Weeks.

Speech Pathologist: Can you tell me about your main concerns? I understand that you recommended that Kylie be referred for a language assessment.

Ms Weeks: Well, it’s her spoken language mostly, although she does also have some difficulty following complex instructions. She is starting to sound really immature compared to the rest of the class. It is really hard to follow what she is saying during news time because she leaves out so much information. She needs a lot of prompts. She rarely answers questions in class and even when she is not put on the spot she uses really short sentences.

Ms Weeks: Her grammar is also really immature - for example she still confuses “I” and “me” and “he” and “she”. Some of the children in Kindergarten still do that but now she is in a Grade 1 class she is really starting to stand out. Her written language is really poor too.

Speech Pathologist: What’s her behaviour like?

Ms Weeks: I really feel for her - she tries hard but she is falling further and further behind. She’s always been quiet but she’s becoming really withdrawn. She tends to play by herself or with the Kinders at lunchtime. Did you know that she repeated Kindergarten?

Speech Pathologist: No I didn’t. Can you tell me why that decision was made?
Ms Weeks: When Kylie started school she was very young - only 4. Her readiness for school was questionable from the start - she still really needed an afternoon nap for most of the first term and she had difficulty independently managing her recess and lunch. By the end of term 2 she had developed and although her language was still delayed and she was behind other members of the class she was generally coping with classroom routines.

Well, the school and Kylie's parents, Jenny and John spent all of term 4 debating about what to do. In the end they decided that although Kylie had come a long way, an extra year in Kindergarten would improve her chance of coping with the more formal demands of a Grade 1 classroom.

Speech Pathologist: Has the extra year in Kindergarten been of assistance to Kylie?

Ms Weeks: Well in some ways it has. Certainly being one of the older rather than younger students helped. She developed independent self help skills such as managing her drink bottle. She also coped much better with the demands of a full day of school. I think she would have been at a real disadvantage in grade 1 without an extra year in kindergarten.

Her language skills gradually improved and so did her class work. However, despite her progress, she is still really working at an early kindergarten level and we are currently midway through grade one.
Ms Weeks: It’s not that she isn’t improving - she is. It is just that the academic demands and the abilities of her classmates are increasing at a faster rate. I’m afraid that as the term goes on the gap between Kylie’s skills and the rest of the class is getting bigger.

Speech Pathologist: From what you’re saying, it sounds like you are concerned about a lot of areas of Kylie’s development, not just language abilities. Has Kylie ever been referred for any assessment of her general learning ability?

Ms Weeks: Yes I am concerned about a lot of areas. She hasn’t been referred yet. When you assess her tomorrow can you please refer her to the Guidance Officer if you think it would be useful.

PLAN: Investigate language abilities - possible referral to Guidance Officer depending on CELF 4 findings.
Kylie’s Report

- Core Language Score
- Index Scores

You can find out information by reading sections of Kylie’s reports.

Move the mouse over Core Language Score and click the left mouse button.

Level 1 Interpreting the Core Language Score

Core Language Score

The core language score is a measure of overall language performance. It is the most sensitive measure for determining whether or not a language disorder exists. Students who obtain a core language score above 85 usually don’t require further standardized assessment.

If you look at Kylie’s standard score, you will see that she obtained a standard score of 54 (confidence interval 51-57). From the CELF 4 manual, her confidence interval places her language performance in the low/severe range. Students like Kylie require further assessment to determine the exact nature of their language disorder.
Kylie’s Score

<table>
<thead>
<tr>
<th>Core Score</th>
<th>Standard Score</th>
<th>Standard Score CI 68% Level</th>
<th>PR**</th>
<th>PR** CI 68% Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Language Score</td>
<td>54</td>
<td>51 to 57</td>
<td>0.1</td>
<td>0.1 to 0.2</td>
</tr>
</tbody>
</table>

*CI = Confidence Interval **PR = Percentile Rank

Information from the CELF 4 Manual

<table>
<thead>
<tr>
<th>Core Language and Index Scores</th>
<th>Classification</th>
<th>Relationship to Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>116 and above</td>
<td>Above average</td>
<td>+1 SD and above</td>
</tr>
<tr>
<td>85 to 115</td>
<td>Average</td>
<td>Within +/- 1 SD</td>
</tr>
<tr>
<td>78 to 84</td>
<td>Marginal/borderline/mild</td>
<td>Within -1 to -1.5 SD</td>
</tr>
<tr>
<td>71 to 77</td>
<td>Low range/moderate</td>
<td>Within -1.5 to -2 SD</td>
</tr>
<tr>
<td>70 and below</td>
<td>Very low range/severe</td>
<td>-2 SD and below</td>
</tr>
</tbody>
</table>

Hint: if you need more information about some of the terms used here go to the resource room.

Kylie’s Report

- Core Language Score
- Index Scores

You can find out information by reading sections of Kylie’s reports.

Move the mouse over Index Scores and click the left mouse button.
Level 2 Interpreting Index Scores

These scores give information about a student’s strengths and weaknesses in receptive and expressive language as well as content and structure. The purpose of index scores is to describe the nature of the language disorder.

Index scores are norm referenced with a mean of 100 and a standard deviation of 15. Use the confidence intervals rather than the actual standard score when interpreting assessment information.

For children aged 5-8, four index scores are calculated to complete level 2 of the assessment process.

<table>
<thead>
<tr>
<th>Index Scores</th>
<th>Standard Score</th>
<th>Standard Score CI* 68% Level</th>
<th>PR**</th>
<th>PR** CI* 68% Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive Language Index</td>
<td>84</td>
<td>79 to 89</td>
<td>14</td>
<td>8 to 23</td>
</tr>
<tr>
<td>Expressive Language Index</td>
<td>51</td>
<td>47 to 55</td>
<td>0.1</td>
<td>&lt;0.1 to 0.1</td>
</tr>
<tr>
<td>Language Content Index</td>
<td>74</td>
<td>70 to 78</td>
<td>4</td>
<td>2 to 7</td>
</tr>
<tr>
<td>Language Structure Index</td>
<td>54</td>
<td>50 to 58</td>
<td>0.1</td>
<td>&lt;0.1 to 0.3</td>
</tr>
</tbody>
</table>

*CI = Confidence Interval **PR = Percentile Rank

Information from the CELF 4 Manual

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<tr>
<td>70 and below</td>
<td>Very low range/severe</td>
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</tr>
</tbody>
</table>
Descriptive Information for CELF 4 Manual

<table>
<thead>
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<td>-2 SD and below</td>
</tr>
</tbody>
</table>

For example, Kylie’s receptive language index score is 84. The confidence interval is 79-98 and so there is a 68% chance her score falls within this range. Using the confidence interval, Kylie can be said to have borderline-average receptive language abilities.

More Descriptive Information

Standard scores can also be used to examine whether the difference between standard scores is significant. The first step is to determine whether there is a statistically significant difference between receptive and expressive language indexes. This is done by subtracting the expressive language index score from the receptive language index score.

The same procedure is completed with the language content index and the language structure index score. The differences can then be examined to determine whether they are statistically significant and more importantly how rare these differences are in the population.
### Differences in Index Scores

<table>
<thead>
<tr>
<th>Indexes</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Difference</th>
<th>Critical Value</th>
<th>Significant Difference (Y or N)</th>
<th>Prevalence</th>
<th>Level of Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive-Expressive</td>
<td>84</td>
<td>51</td>
<td>33</td>
<td>12</td>
<td>Y</td>
<td>&lt;0.1%</td>
<td>0.5</td>
</tr>
<tr>
<td>Language Content - Structure</td>
<td>74</td>
<td>54</td>
<td>20</td>
<td>11</td>
<td>Y</td>
<td>2.1%</td>
<td>0.5</td>
</tr>
</tbody>
</table>

From the table above, both the differences between the expressive and receptive language scores and the content and structure scores are significant statistically. The next important step is to establish how common this is in the population because it is possible to have differences that are statistically significant but still occur relatively frequently in the population.

### Differences in Index Scores (continued)

<table>
<thead>
<tr>
<th>Indexes</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Difference</th>
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<td>11</td>
<td>Y</td>
<td>2.1%</td>
<td>0.5</td>
</tr>
</tbody>
</table>

On the CELF 4, differences which occur in less than 5% of the population are considered rare. In Kylie's case, the prevalence of a 33 point difference is so rare that there isn’t a data value for it. All that can be said is that this difference occurs in less than 0.1% of the population. The difference in her content and structure scores is also rare, occurring in only 2.1% of the population.
Differences in Index Scores (continued)

<table>
<thead>
<tr>
<th>Indexes</th>
<th>Score 1</th>
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</tr>
<tr>
<td></td>
<td>74</td>
<td>54</td>
<td>20</td>
<td>11</td>
<td>Y</td>
<td>2.1%</td>
<td>0.5</td>
</tr>
</tbody>
</table>

From the above data, it is clear that Kylie’s main areas of difficulty are with expressive language and the structure of language. Given that there are such large discrepancies in the index scores, examination of the index scores is likely to be more clinically useful than examination of the core language score.
Kylie’s File

The following points were noted in her file:

Notes from assessment:

- Very shy on entering the room.
- Would not speak to me for 15 minutes.
- Was happy to complete assessments which did not require verbal responses.
- Gave minimal information on tasks which required her to talk.
- Didn’t cope well with challenging tasks – little perseverance – strategies: swings on chair, puts head down on table – minimal eye contact.

Now you've seen your office I'll show you the resource room.

You will find information about tests and language disorders in the resource room.

Click on the resource room door with the left mouse button.
Resource Room

• **Glossary**

Click on **Glossary** with your left mouse button to find more information.
## Glossary

**CLICK ON THE DOOR FOR MORE DEFINITIONS**

| **CELF 4:** | A test designed to measure language development in school aged children. |
| **Confidence Interval:** | When a person is tested, there is always some error. Confidence intervals allow us to determine the likelihood that a child’s real score would fall within a range specified in the test manual. We can also choose the level of confidence we want to place in the score range. For example if we want a high level of confidence we pick a high confidence interval such as 95%. This means that we are 95% certain that a child’s real score would fall in the specified range. It is important to use confidence intervals rather than a single score when making decisions about a person’s language abilities. |
| **Core Language Score:** | Measure of overall language performance. |
| **Delayed Language Development:** | Where a child’s ability to understand and/or use spoken language is below the level expected for their chronological age. |
| **Expressive Language:** | Describes a person’s ability to communicate using spoken and/or written language. |
| **Grommets:** | Tiny tubes which are inserted into the ear drum to stop fluid building up in the ear. If fluid builds up it can impact on a child’s ability to hear. |
| **Language Content:** | Examines a person’s vocabulary development. |
| **Language Structure:** | Examines a person’s ability to use and understand sentences that are grammatically correct. |
| **Mean:** | The average score. |
| **Norm referenced:** | A test which allows a child’s score to be compared with a group (normative sample) of typically developing children of the same age. Allows comparison of language development relative to other children the same age. |
Glossary

CLICK ON THE DOOR TO RETURN TO THE RESOURCE ROOM

Percentile Rank:
This measures how well a child has performed when compared with other children the same age. A child who has a percentile rank of 25 performed at the same level of higher than 25% of children their age. It also means that 75% of children the same age performed at a higher level.

Receptive Language:
Describes a person’s ability to understand language.

Standard Score:
A score that has been converted to make it possible to compare the performance of a child with other children the same age.

SD (standard deviation):
A measure of how far the performance of a child differed from the mean. If they score above the mean the standard deviation will be positive. If they score below the mean the standard deviation will be negative.
Meeting Room

- **Question 1**
- **Question 2**
- **Question 3**

Click on Question 1 with your left mouse button to read the question.

The next room you need to know about is the meeting room.

You will find questions from Kylie’s school here. They will need to be answered once you have found the information. I’ll tell you more about your task once I finish showing you around.

Click on the meeting room door with the left mouse button.
Meeting Room Questions

Question 1
What did your interpretation of Kylie’s test results reveal about her language skills?

CLICK ON THE DOOR TO CONTINUE THE MODULE

Meeting Room

• Question 1
• Question 2
• Question 3

Click on Question 2 with your left mouse button to read the question.
Meeting Room Questions

Question 2
To what extent do you believe the assessment results provided an accurate picture of Kylie’s language skills? What else might you have liked to consider?

CLICK ON THE DOOR TO RETURN TO THE MEETING ROOM
Meeting Room Questions

Question 3

Describe the factors that you believe might have impacted on Kylie’s language development.

CLICK ON THE DOOR TO RETURN TO THE MEETING ROOM

Your Task

Now that you’ve had a chance to look around. Let me tell you about your task.

You need to find out about Kylie by reading information contained on this site. The assessments are already completed, but you will need to combine the information from different sources to complete the questions located in the meeting room.

Once you have enough information to answer the questions, go to the Blackboard discussion forum and post your answers. All responses are anonymous.
Click on the doors with the left mouse button.
Appendix 2: Clinical Educator Survey Content

Note: this appendix contains the content of the survey for the clinical educators. However, to reduce the space required the survey has been reformatted and does not reflect the original formatting of the survey.

Do you give consent for your responses to be collected for the purpose of being included in the research outlined in the information statement?

- No, I do not wish to participate in this study.
- I will include comments but do not use them for research.
- Yes I will participate in this research.

How many speech pathology students have you supervised?

- 0
- 1-2
- 3-5
- 5-10
- 10+

The information contained in the phone interview to the parent represents a realistic clinical scenario.

- Strongly Disagree
- Disagree
- Neither Disagree or Agree
- Agree
- Strongly Agree

The information contained in the phone interview to the teacher represents a realistic clinical scenario.

- Strongly Disagree
- Disagree
- Neither Disagree or Agree
- Agree
- Strongly Agree
The information contained in the pre-test questionnaire assesses psychometric skills essential for the interpretation of standardised assessments.

- [ ] Strongly Disagree
- [ ] Disagree
- [ ] Neither Disagree or Agree
- [ ] Agree
- [ ] Strongly Agree

What feature(s) of the learning module did you think would be beneficial?

...................................................................................................................................................
...................................................................................................................................................
...................................................................................................................................................

What feature(s) of the learning module need improvement?

...................................................................................................................................................
...................................................................................................................................................
...................................................................................................................................................

Please write any additional comments here.

...................................................................................................................................................
...................................................................................................................................................
...................................................................................................................................................
Appendix 3: Pre/Post-Test Questions

*Note:* this appendix contains the content of the pre/post-test. However, to reduce the space required the survey has been reformatted and does not reflect the original formatting of the survey.

Thank you for agreeing to complete these questions. The information presented below is part of a case study for “Jenny”, a 13 year-old girl who is experiencing some language difficulties. A second case study for “Peter” an 8 year-old boy is also presented.

It does not matter how much training or experience you have in dealing with language difficulties because all of the information you require to answer the questions about each case is presented below.

Please circle the letter that corresponds to the best answer from the options presented to you. We would appreciate it if you could answer all questions.

**Case 1**

Jenny obtained a core language standard score of 87.

Table 1 presents information to help you understand what this score means for Jenny.

<table>
<thead>
<tr>
<th>Standard Score</th>
<th>Percentile Rank</th>
<th>95% Confidence Interval</th>
<th>90% Confidence Interval</th>
<th>68% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>94</td>
<td>34</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>93</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>19</td>
<td>+/− 6</td>
<td>+/− 5</td>
<td>+/− 3</td>
</tr>
<tr>
<td>86</td>
<td>18</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2 presents additional information about the Core Language Score

<table>
<thead>
<tr>
<th>Core Language and Index Scores</th>
<th>Classification</th>
<th>Relationship to mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>116 and above</td>
<td>Above average</td>
<td>+ 1 SD and above</td>
</tr>
<tr>
<td>85 to 115</td>
<td>Average</td>
<td>Within - + 1 SD</td>
</tr>
<tr>
<td>78 to 84</td>
<td>Marginal/Borderline/Mild</td>
<td>Within -1 to -1.5 SD</td>
</tr>
<tr>
<td>71 to 77</td>
<td>Low Range/Moderate</td>
<td>Within -1.5 to -2 SD</td>
</tr>
<tr>
<td>70 and below</td>
<td>Very low range/severe</td>
<td>-2 SD and below</td>
</tr>
</tbody>
</table>

Figure 1 is a normal curve and it offers additional interpretive information

Case 2

Peter is an 8 years and 5 months old (8;5). He obtained the following index scores on a language test.

Table 3 presents Peter's Index Scores:

<table>
<thead>
<tr>
<th>Indexes</th>
<th>Standard Score</th>
<th>Standard Score CI*</th>
<th>PR**</th>
<th>PR CI 90% Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive Language Index</td>
<td>79</td>
<td>72 to 86</td>
<td>8</td>
<td>3 to 18</td>
</tr>
<tr>
<td>Expressive Language Index</td>
<td>61</td>
<td>55 to 67</td>
<td>0.5</td>
<td>0.1 to 1</td>
</tr>
<tr>
<td>Language Content Index</td>
<td>84</td>
<td>78 to 90</td>
<td>14</td>
<td>7 to 25</td>
</tr>
<tr>
<td>Language Structure Index</td>
<td>76</td>
<td>69 to 83</td>
<td>5</td>
<td>2 to 13</td>
</tr>
</tbody>
</table>

* Confidence interval
**Percentile rank
Table 4 presents differences between Peter’s Index Scores

<table>
<thead>
<tr>
<th>Indexes</th>
<th>Score 1</th>
<th>Score 2</th>
<th>Difference</th>
<th>Clinical Significance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive-Expressive Language Index</td>
<td>79</td>
<td>61</td>
<td>18</td>
<td>3.9%</td>
</tr>
<tr>
<td>Language Content-Structure Index</td>
<td>84</td>
<td>76</td>
<td>8</td>
<td>19.9%</td>
</tr>
<tr>
<td>Working Memory Index</td>
<td>77</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Core Language Score</td>
<td>64</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

*Clinically significant if occurs in 5% (or less) of population.

Table 5 presents the levels required for differences in Peter’s scores to be considered statistically significant.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Level of Significance</th>
<th>Receptive-Expressive Difference Statistical Significance</th>
<th>Content-Structure Difference Statistical Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>6;6-6;11</td>
<td>0.15</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>7;0-7;11</td>
<td>0.15</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>8;0-8;11</td>
<td>0.15</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

Examine Table 6 to answer questions 16 & 17

<table>
<thead>
<tr>
<th></th>
<th>Core Language Score</th>
<th>Receptive Language Index</th>
<th>Expressive Language Index</th>
<th>Language Content Index</th>
<th>Working Memory Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>68% Confidence Interval +/-</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>90% Confidence Interval +/-</td>
<td>5</td>
<td>7</td>
<td>6</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>95% Confidence Interval +/-</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>
Examine Table 7 to answer questions 18, 19, 20.

<table>
<thead>
<tr>
<th>Scaled Score</th>
<th>Confidence Interval 68%</th>
<th>Percentile Rank</th>
<th>Percentile Rank Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts &amp; Following Directions</td>
<td>10</td>
<td>9 to 11</td>
<td>50</td>
</tr>
<tr>
<td>Word Structure</td>
<td>6</td>
<td>5 to 7</td>
<td>9</td>
</tr>
<tr>
<td>Recalling Sentences</td>
<td>7</td>
<td>6 to 8</td>
<td>17</td>
</tr>
<tr>
<td>Formulated Sentences</td>
<td>3</td>
<td>2 to 4</td>
<td>1</td>
</tr>
</tbody>
</table>

**The following questions relate to Jenny (case 1)**

At the 90% confidence interval, Jenny’s true score range is:

- [ ] 87
- [ ] Between 81 and 93
- [ ] Between 82 and 92
- [ ] Between 84 and 91
- [ ] Not sure

The percentile rank corresponding to Jenny’s standard score range is:

- [ ] 19
- [ ] 10-32
- [ ] 14-27
- [ ] 12-30
- [ ] Not sure

At the 68% confidence interval, Jenny’s true score range is:

- [ ] 87
- [ ] Between 82 and 92
- [ ] Between 68 and 96
- [ ] Between 84 and 90
- [ ] Not sure
In qualitative terms, Jenny’s overall language ability is best described as being:

☐ Marginal-average
☐ Marginal
☐ Average
☐ Average-above average
☐ Not sure

Let’s imagine Jenny’s percentile rank was 53. This means:

☐ Jenny obtained a score equal to 47% of the population
☐ Jenny obtained a score equal to 53% of the population
☐ Jenny obtained a score equal or above to 53% of the population
☐ Jenny obtained a score equal or below to 53% of the population
☐ Not sure

At the 90% confidence level:

☐ There is a 90% chance that the score obtained is the true score
☐ There is a 10% or less chance of a true score lying outside the confidence interval
☐ There is a 10% chance of a true score lying outside the confidence interval
☐ There is a 10% or more chance of a true score lying outside the confidence interval
☐ Not sure

Which of the following statements about Jenny is true?

☐ Jenny’s core language standard score is 87 (range at the 90% confidence interval 81-93, percentile rank 81) and is best characterised as being average
☐ Jenny’s core language standard score is 87 (range at the 68% confidence interval 84-90, percentile rank 19) and is best characterised as being average
☐ Jenny’s core language standard score is 87 (range at the 95% confidence interval 81-93, percentile rank 19) and is best characterised as being marginal-average
☐ Jenny’s core language standard score is 87 (range at the 90% confidence interval 82-92, percentile rank 19) and is best characterised as being marginal
☐ Not sure
Based on your examination of the confidence intervals, which of the following statements is true:

- The 68% confidence interval is the most conservative estimate of the true score range
- The 95% confidence interval is the most conservative estimate of the true score range
- The 90% confidence interval is the most conservative estimate of the true score range
- The percentile rank is the most conservative estimate of the true score range
- Not sure

Based on Jenny’s standard score, which of the following statements is true:

- The score is 1-1.5 standard deviations above the mean
- The score is 1.5 standard deviations below the mean
- The score is 1 standard deviation below the mean
- The score is 1 standard deviation above the mean
- Not sure

A score that is 2 standard deviations below the mean corresponds to which percentile on the normal curve:

- 50%
- 14%
- 2%
- 1%
- Not sure

The following questions relate to Peter (case 2)

On which language index has Peter obtained the highest percentile rank?

- Language content index
- Expressive language index
- Language structure index
- Receptive language index
- Not sure
What pair of index scores are most discrepant for Peter?
- Core language-expressive index
- Content-structure index
- Content-working memory
- Receptive language index
- Not sure

The difference between Peter’s receptive and expressive language index scores is
- Statistically significant only
- Statistically and clinically significant
- Clinically significant only
- Not significant
- Not sure

The difference between Peter’s content and index scores is
- Statistically significant only
- Statistically and clinically significant
- Clinically significant only
- Not significant
- Not sure

Peter’s data was collected using the 0.15 level of significance. If the data was re-evaluated using a 0.05 level of significance, which of the following would be true:
- The difference in index scores would have to be greater to be statistically significant
- The difference in index scores would have to be smaller to be statistically significant
- It would make no difference to the required difference in index scores
- The difference would depend on the age of the child
- Not sure

Imagine Peter obtained an expressive language index score of 80. At a confidence interval of 90%, Peter’s true score is likely to be between:
- 75 and 85
- 76 and 84
- and 86
- 3 and 87
If Peter’s core language score was 75, the most conservative estimate of Peter’s score range would be:

- 70 to 80
- 71 to 79
- 68 to 82
- 69 to 81
- Not sure

How many standard deviations from the mean is the scaled score for concepts and following directions:

- 0
- +1.5
- -1
- +1
- Not sure

Which subtest(s) is an area of relative strength:

- Recalling sentences
- Concepts and following directions
- Recalling sentences and concepts and following directions
- None
- Not sure

Which subtest(s) is an area of relative weakness:

- Recalling sentences
- Formulated sentences
- Formulated sentences and word structure
- Not sure
## Appendix 4: Pre/Post-Test Results

### Psychology Students Pre-test – all students

#### Case Processing Summary

<table>
<thead>
<tr>
<th>Cases</th>
<th>Valid</th>
<th>Missing</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Totalq1</td>
<td>44</td>
<td>100.0%</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

#### Descriptives

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Statistic</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totalq1 Mean</td>
<td>8.68</td>
<td>.443</td>
</tr>
<tr>
<td>95% Confidence Interval for Mean Lower Bound</td>
<td>7.79</td>
<td></td>
</tr>
<tr>
<td>Upper Bound</td>
<td>9.58</td>
<td></td>
</tr>
<tr>
<td>5% Trimmed Mean</td>
<td>8.65</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>9.00</td>
<td></td>
</tr>
<tr>
<td>Variance</td>
<td>8.641</td>
<td></td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>2.939</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Interquartile Range</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Skewness</td>
<td>.017</td>
<td>.357</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>-.649</td>
<td>.702</td>
</tr>
</tbody>
</table>

#### Tests of Normality

<table>
<thead>
<tr>
<th>Statistic</th>
<th>df</th>
<th>Sig.</th>
<th>Kolmogorov-Smirnov</th>
<th>Statistic</th>
<th>df</th>
<th>Sig.</th>
<th>Shapiro-Wilk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totalq1</td>
<td>.128</td>
<td>44</td>
<td>.070</td>
<td>.970</td>
<td>44</td>
<td>.309</td>
<td></td>
</tr>
</tbody>
</table>

a. Lilliefors Significance Correction
### Psychology Students Pre-test – all students (cont’d)

#### Group Statistics

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total1 1</td>
<td>23</td>
<td>9.26</td>
<td>3.165</td>
<td>.660</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>21</td>
<td>8.05</td>
<td>2.598</td>
<td>.567</td>
<td></td>
</tr>
</tbody>
</table>

*Note: Group 1 = learning module group, Group 2 = control group*

#### Independent Samples Test

<table>
<thead>
<tr>
<th></th>
<th>Levene's Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>t</td>
</tr>
<tr>
<td>Total1</td>
<td>Equal variances assumed</td>
<td>.910</td>
<td>.346</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>1.394</td>
<td>41.555</td>
</tr>
</tbody>
</table>
## Psychology Results Post Test

### Learning Module Group

<table>
<thead>
<tr>
<th></th>
<th>q2total</th>
<th>Totalq1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>t</strong></td>
<td>-.160</td>
<td>1.899</td>
</tr>
<tr>
<td><strong>df</strong></td>
<td>22</td>
<td></td>
</tr>
<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td>.094</td>
<td></td>
</tr>
</tbody>
</table>

### Paired Samples Test

<table>
<thead>
<tr>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.13</td>
<td>3.020</td>
<td>.630</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.26</td>
<td>3.165</td>
<td>.660</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Paired Samples Statistics

<table>
<thead>
<tr>
<th>Pair 1</th>
<th>q2total</th>
<th>Totalq1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>8.76</td>
<td>8.05</td>
</tr>
<tr>
<td>N</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>2.047</td>
<td>2.598</td>
</tr>
<tr>
<td>Std. Error Mean</td>
<td>.447</td>
<td>.567</td>
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</table>

### Paired Samples Test

<table>
<thead>
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<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.714</td>
<td>2.101</td>
<td>.458</td>
<td>-242</td>
<td>1.671</td>
<td>1.558</td>
<td>20</td>
<td>.135</td>
</tr>
</tbody>
</table>

### Control Group

<table>
<thead>
<tr>
<th></th>
<th>q2total</th>
<th>Totalq1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>t</strong></td>
<td>-.242</td>
<td>1.671</td>
</tr>
<tr>
<td><strong>df</strong></td>
<td>20</td>
<td></td>
</tr>
<tr>
<td><strong>Sig. (2-tailed)</strong></td>
<td>.135</td>
<td></td>
</tr>
</tbody>
</table>

### Paired Samples Test

<table>
<thead>
<tr>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>Lower</th>
<th>Upper</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.76</td>
<td>2.047</td>
<td>.447</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.05</td>
<td>2.598</td>
<td>.567</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Paired Samples Statistics

<table>
<thead>
<tr>
<th>Pair 1</th>
<th>q2total</th>
<th>Totalq1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>10.13</td>
<td>9.26</td>
</tr>
<tr>
<td>N</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>3.020</td>
<td>3.165</td>
</tr>
<tr>
<td>Std. Error Mean</td>
<td>.630</td>
<td>.660</td>
</tr>
</tbody>
</table>
# Speech Pathology Students Pre-test – All students

## Case Processing Summary

<table>
<thead>
<tr>
<th>Cases</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Valid</td>
<td>Missing</td>
<td>Total</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Percent</td>
<td>N</td>
</tr>
<tr>
<td>Q1total</td>
<td>43</td>
<td>100.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

## Descriptives

<table>
<thead>
<tr>
<th></th>
<th>Statistic</th>
<th>Std. Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1total</td>
<td>Mean</td>
<td>9.79</td>
</tr>
<tr>
<td>95% Confidence Interval for Mean</td>
<td>Lower Bound</td>
<td>8.83</td>
</tr>
<tr>
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## Tests of Normality

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\(^a\) Lilliefors Significance Correction
Speech Pathology Students Pre-test – All students (cont’d)

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Independent Samples Test

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Note: Group 1 = Learning module group, Group 2 = control group
### Speech Pathology Results Post Test

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**Paired Samples Test**

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### Appendix 5: Content Analysis of Learning Module Questions

#### Content Analysis of Learning Module Question 1

**NVivo Content Analysis Question 1**

**"What did your interpretation of Kylie’s test results reveal about her language skills?"**

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<th>Need Further Assessment</th>
<th>Need Intervention</th>
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Assessment notes

X

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X
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X

Critical language
period

X

X
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X

X

X

X
X
X

X
X

X

X

Hearing

General index
comment

Content Analysis of Learning Module Questions

X
X
X
X
X
X
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X
X
X

X

X
X

X

X

X

X
X
X

X
X

Developmental
history

X
X

X

X
X

X
X
X
X

X
X
X
X
X
X
X
X
X
X

X
X
X

X

X
X

X

LCI**** moderate

X
X
X
X
X
X
X

X
X
X
X
X

X

Need further
assessment

X

X

X

Pragmatic
difficulties

Appendix 5:

Language
delay/Disorder
X

Classroom
difficulty

X
X

Disorder severe
X

X

Page 262

X

Social difficulty

X
X
X

CLS*****
X
X

Need Intervention

X
X

E LI* & LSI**
Severe
X
X

Additional Information
Results support
parent/teacher
concerns

X
X
X
X
X

RLI*** relative
strength

X

RLI ELI
Difference
X
X

CLI LSI
Difference

X
X

Clinical/Statistical
significance

X
X
X
X
X
X
X
X
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SD

X
X
X

PR

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Statistics
M

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X
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CELF 4
CI

SP 1
SP 2
SP 3
SP4
SP5
SP6
SP8
SP9
SP10
SP15
SP27
SP29
SP31
SP33
SP35
SP36
SP37
SP38
SP41
SP42
SP46
SP47
SP48
SP50
SP51
SP52
SP53
SP55

Participant

NVivio Content Analysis Question 1
“What did you interpretation of Kylie’s test results reveal about her language skills?”

Self Esteem


## NVivo Content Analysis Question 1

"What did you interpretation of Kylie's test results reveal about her language skills?"

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**Note:** P = Psychology participant, SP = Speech Pathology participant, CLS = Core Language Score, ELI = Expressive Language Index, LSI = Language Structure Index, LCI = Language Content Index, RLI = Receptive Language Index, SD = Standard Deviation, PR = Percentile Rank, M = Mean, CI = Confidence Interval.
Content Analysis for Learning Module Question 2

**NVivo Content Analysis Question 2**

“To what extent do you believe the assessment results provided an accurate picture of Kylie’s language skills? What else might you have liked to consider?”

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### NVivo Content Analysis Question 2

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**NVivo Content Analysis Question 2**

“To what extent do you believe the assessment results provided an accurate picture of Kylie’s language skills? What else might you have liked to consider?”

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**Note:** P = Psychology participant, SP = Speech Pathology participant, CELF = Language assessment- Clinical Evaluation of Language Fundamentals 4th Ed Australian, TR = Teacher, CI = Confidence Interval, PA = Phonological Awareness, OMA = Oral Muscular Assessment, OT = Occupational Therapist.
Content Analysis for Learning Module Question 3

NVivo Content Analysis Question 3

“Describe the factors that you believe might have impacted on Kylie’s language development.”

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**Question 3:** *Describe the factors that you believe might have impacted on Kylie’s language development.*

- Older sibling
- Parent child interaction
- Home environment
- Medical conditions
- Emotional State
- Developmental delay
- Hearing ear infections
- Critical period language
- Language delay
- Repeating kindergarten
- School too early
- Attendance Preschool
- Limited early intervention
- Teacher child interaction
- Not making friends

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*Note: The table above represents the factors that might have impacted Kylie’s language development based on participant responses.*
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<tr>
<th>Conditions</th>
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*Note: P = Psychology participant, SP = Speech Pathology participant*
References


