APPROACHES TO SOCIAL CONSTRUCTIVIST ACCOUNTING EDUCATION

by

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ABSTRACT

APPROACHES TO SOCIAL CONSTRUCTIVIST ACCOUNTING EDUCATION

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SUPERVISOR: Prof S.A. Coetzee

DEPARTMENT: Accounting

DEGREE: PhD (Accounting Sciences)

A competency-based approach to teaching, learning and assessment that focuses on the development of competencies that are essential for success in the accounting profession, has been proposed for accounting education. Rooted in social constructivism, this thesis reports on three competency-based approaches to accounting education.

Paper 1 explores undergraduate accounting students' perceptions of their experience of team teaching and suggests that the respondent students assessed the teaming and equal status models of team teaching positively. The students were statistically significantly more positive about the advantages of the teaming model than the equal status model. The teaming model provides students with lectures that, from their perspective, are more interesting, aid the students' understanding, and provide students with faster and more individualized support than the equal status model. In adopting the teaming model, teachers should, however, consider sources of possible confusion and intimidation.

Paper 2 discusses the development of two Messenger bots using Chatfuel, a visual development environment for developers that do not have any programming or coding knowledge. Informed by social constructivist learning, the content of the messages sent to the students was carefully scripted and personalized, to encourage anthropomorphism on the part of the student users. The majority of the respondent student users expressed their

overall satisfaction with the Messenger bots. The methodology applied in the development of the different bots can be used by instructors in developing their own Messenger bots, to support their teaching and their students' learning.

Paper 3 reports on the development, and the students' perceptions of their experience, of a Team Assessment with Immediate Feedback (TAIF), in which immediate formative feedback is provided to the students by their peers and the assessment instrument (the IF-AT® form). Results of the quantitative and qualitative data, collected in a survey, suggest that the majority of the students experienced the TAIF positively. The study provided some initial evidence that a team assessment in a culturally diverse student cohort may enhance intercultural collaboration. Team assessments may also contribute towards re-establishing the link between professional accounting education and practice.

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1 CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION

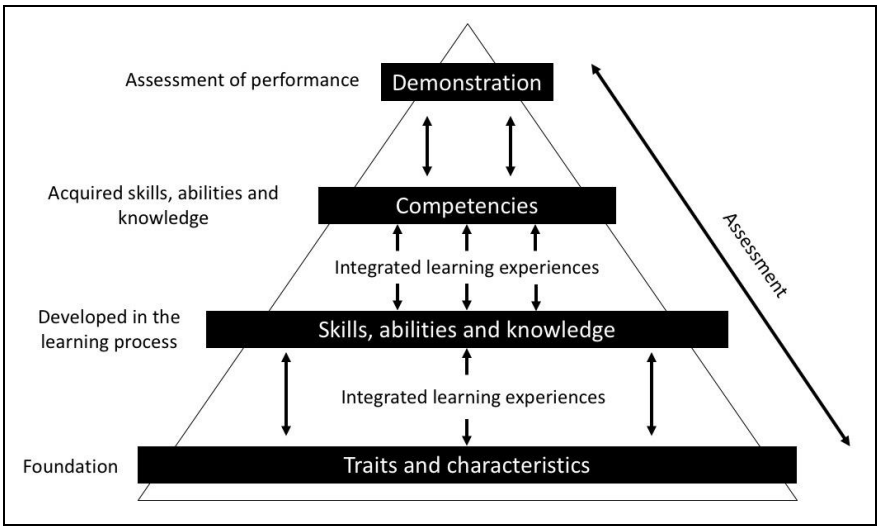
The International Accounting Education Standards Board (IAESB) encourages "the implementation of a learning outcomes approach[1] [which] will serve the public interest by enhancing the development of professional competence needed to perform a role as a professional accountant" (IAESB, 2016). The outcomes-based approach to teaching and learning places the emphasis on a systematic curriculum with standardized outcomes that should be achieved by students at the end of their learning experience (Harden, 1999; Malan, 2000; Spady, 1994). The main purpose, therefore, of an outcomes-based approach is to teach the student the task related to the outcome and to enable the student to perform any task in their curriculum without assistance (Boritz & Carnaghan, 2003; Davies, 1976).

Emerging from the broader outcomes-based approach is the competency-based approach, which is focused on competencies that are essential for success in a particular profession (Abbasi, 2013; Blank, 1982; Bolt-Lee & Foster, 2003; Boritz & Carnaghan, 2003; Spady, 1977). These competencies are the set of knowledge, skills, and abilities required by a profession (Lawson *et al*., 2013; Pathways Commission, 2015). Knowledge is the intellectual content to be learned, skills are the capabilities to apply the knowledge to achieve specific goals and objectives, and abilities are the application of knowledge and skills in a professional work environment (Lawson *et al*., 2013). Competency-based education begins with the competencies that the students are required to achieve in order to be successful in a specific profession and then develops the curriculum based on these required competencies (Frank *et al*., 2010). Competency-based education requires a broadening of assessment from its traditional summative focus on assessment of knowledge to approaches that integrate the formative assessment for learning, to construct knowledge, and develop skills, behaviour and abilities throughout the learning process (Harris *et al*., 2017).

[1] Although the IAESB refers to an 'outcomes-based' approach to accounting education, the IAESB consistently refers to professional competence as the outcome of the education process (IAESB, 2016).

A National Postsecondary Education Cooperative[2] report visually conceptualized the learning process in competency-based education in a model (Figure 1.1). At the base of this pyramid shaped model are the students' traits and characteristics that form the foundations of learning. Through the facilitation and scaffolding of learning, the students' knowledge, skills and abilities develop up to the pinnacle of a student demonstrating competence. Formative assessment is deeply embedded throughout this learning process.

Figure 1-1: The learning process in competency-based education



Source: NCES, 2018

During the 1990s, competency-based education for several professional qualifications, including accounting, gathered momentum in, inter alia, Australia, Canada, the Netherlands, New Zealand, South Africa, the United Kingdom and the United States (Boritz & Carnaghan, 2003), with numerous professional accounting bodies[3] in these countries developing competency frameworks. A competency framework provides guidance to instructors to implement competency-based education, training and assessment for a specific profession (Bolt-Lee & Foster, 2003; Boritz & Carnaghan, 2003).

[2] The National Postsecondary Education Cooperative is a voluntary organization that encompasses all sectors of the postsecondary education community with a stated mission to "promote the quality, comparability and utility of postsecondary data and information that support policy development at the federal, state, and institution levels" (NCES, 2018).

[3] For example: American Institute of Certified Public Accountants (AICPA), Association of Chartered Certified Accountants (ACCA), Australian Society of Certified Public Accountants (ASCPA), Canadian Institute of Chartered Accountants (CICA), New Zealand Institute of Chartered Accountants (NZICA), and the South African Institute of Chartered Accountants (SAICA).

The shift towards competency-based education was to increase the professional relevance of courses by providing greater consistency between educational and training outcomes and the abilities required for a professional work environment (Kerka, 1998; Malone & Supri, 2012; Norman, Norcini & Bordage, 2014).

Competency-based education has, however, been criticized. The competency-based approach may limit the content of the curriculum and assessment to knowledge and skills which are observable and measurable, rather than all competencies required (Malone & Supri, 2012; Norman, Norcini & Bordage, 2014; Ten Cate & Billett, 2014). This may be of particular concern where instructors resist the shift from asking, "What do students need to know?" or "How shall we teach learners?" to "What abilities are needed of graduates" (Frank *et al*., 2010). Competency-based assessment therefore requires a shift away from isolated, high stakes, point-in-time traditional summative assessments to more formative assessment methods, emphasising assessment for learning (Harris *et al*., 2017). It is crucial that instructors 'buy in' to the change in mindset necessary to facilitate competency-based education. Instructors should also be supported by research and professional development pertaining to teaching, learning and assessment methods suited to knowledge and skills which are not easily observable and measurable.

Outcomes- and competency-based education have their origins in the behaviourist learning theory (Morcke, Dornan & Eika, 2013). Although competency-based education may be behaviourist (Boritz & Carnaghan, 2003; Kerka, 1998), the main goal of an alternative learning theory, constructivism, is competence (Motschnig-Pitrik & Holzinger, 2002). Historically, the construction of knowledge was seen as a personal quality or attribute. There has, however, been increasing acknowledgement that learning is a social-based process, where communication and negotiation skills come into play when a learner faces new challenges in authentic problem solving (Laurillard, 1995; McLoughlin & Luca, 2002). By comparing these learnings theories (Table 1.1), it is, however, submitted that there is not necessarily a clear opposition and definite boundaries between them and that the paradigms may overlap.

Table 1-1: Learning theories compared

	Behaviourism	Constructivism	Social Constructivism
Image of learner	• Passive • Individual • Extrinsically motivated	• Active • Individual • Intrinsically motivated	• Active • Social • Socially motivated
Image of teaching and learning	• Teacher transmits knowledge and skills • Learning depends on teaching and systematic reinforcement of correct behaviours	• Teacher gives learner opportunity to construct knowledge and skills gradually through experience • Learning can be independent of teaching	• Knowledge and skills are constructed gradually through experience, interaction and support by a 'knowledgeable other' • Learning comes through interdependence
Activities	• Learners listening to teacher	• Individuals experimenting or otherwise doing something	• Class, group or individual discussion with other learners or the 'knowledgeable other' • Group problem-solving
Characteristics	• Draws directly on existing subject knowledge in a logical linear manner	• Uses direct experiences and allows learner to explore their own way at their own pace	• Encourages collaboration

Source: Pollard *et al.*, 2014

1.2 BEHAVIOURISM

Behaviourism is the most promoted and influential competency-based approach as it is easy to specify task-based behaviours as competencies (Harris *et al*., 2017; Jones & Moore, 1995). Behaviourism equates learning to a specified and measurable change in a student's behaviour in response to a particular environmental stimulus (Ertmer & Newby, 1993; Fosnot & Perry, 1996; Nalliah & Idris, 2014; Taylor & Hamdy, 2013). The student is

essentially passive in this process and learning is accomplished when a desired reactionary response is shown by the student to a specific environmental stimulus introduced by the instructor (Boghossian, 2006; Ertmer & Newby, 1993; Fosnot & Perry, 1996; Nalliah & Idris, 2014). The student is characterized by being reactive to the environment rather than actively discovering the environment (Ertmer & Newby, 1993; Nalliah & Idris, 2014).

A student's behaviour is shaped through positive or negative reinforcement of their response to a stimulus. Positive or negative reinforcement is thought to increase the probability that the behaviour will be repeated (Ertmer & Newby, 1993; Nalliah & Idris, 2014). A behaviourist instructor would, for example, interpret a student's correct response to a question as a sign of successful conditioning or education, and then continue to reinforce correct responses behaviourally by assigning good grades and motivating a student through encouragement, positive comments and rewards (Boghossian, 2006; Ertmer & Newby, 1993; Nalliah & Idris, 2014). In subsequent assessment of the behavioral change, any forgetting is attributed by behaviourists to the 'nonuse' of the response over time, resulting in periodic practice or review by the instructor to maintain the student's readiness to respond (McLeod, 2003; Schunk, 1991).

The transfer of knowledge in behaviourism is said to occur when the student is able to generalize their response to stimuli involving identical or similar features (Ertmer & Newby, 1993). The behaviourist approach to learning therefore focuses on the "what" through methods like rote memorization, identification and association (McLeod, 2003).

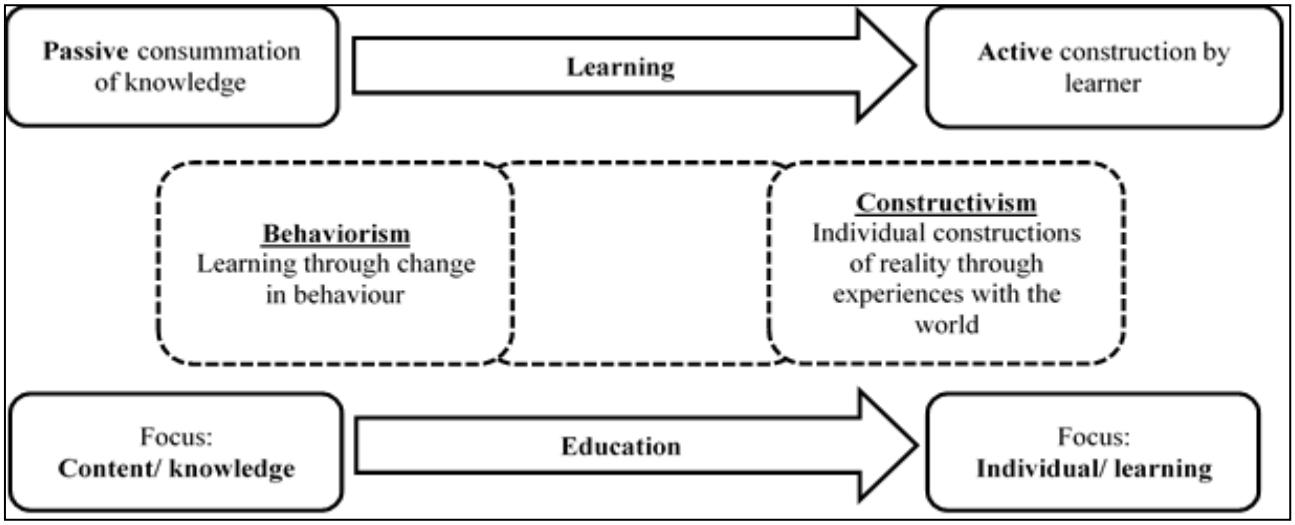
Instructors advocating behaviourism will pre-assess the student's initial knowledge to determine where instruction should begin and will plan a curriculum by breaking the curriculum down into observable and measurable outcomes that a student should achieve (Ertmer & Newby, 1993; Fosnot & Perry, 1996). Behaviourism was strongly influenced by a philosophical movement called positivism (Amsel, 1989). Positivism only recognizes relationships that are discovered by observation and experiment (Boghossian, 2006). Consequently, only behaviours that are observable and measurable are generally included as outcomes in a behaviourist curriculum (Nalliah & Idris, 2014). Such observable and measurable outcomes largely reflect lower level skills of Bloom's taxonomy or Miller's

pyramid, rather than skills requiring greater depth of processing that may not be observable and measurable (e.g. problem solving, inference making, critical thinking and collaboration) (Ertmer & Newby, 1993).

1.3 CONSTRUCTIVISM

The objective of constructivist learning is not to retrieve intact measurable knowledge structures but to construct knowledge based on prior experience (Boghossian, 2006; Ertmer & Newby, 1993). Constructivist learning, drawing on the theories of Rousseau, John Dewey and Jean Piaget, is based on the principle that a connection between an experience and an environmental stimulus helps the student construct meaning or knowledge to facilitate learning (Ertmer & Newby, 1993). The focus in a constructivist approach to learning therefore shifts from the behaviourist transmission of objective knowledge to the construction of individual understanding (Figure 1.2). Constructivist outcomes may therefore not all be objective, specified and measurable, thus allow learning at higher levels of Bloom's taxonomy (Ertmer & Newby, 1993) or Miller's pyramid (Harris *et al*., 2017). Constructivism is therefore widely supported by educationalists (Nalliah & Idris, 2014).

Figure 1-2: Behaviourism and constructivism



Source: Mueller, 2012 (adapted)

Constructivists view knowledge as a function of how individuals actively create meaning from their own experiences and personal interaction with the world rather than having knowledge of an external world passively and 'behaviouristicly' mapped onto them (Ertmer & Newby, 1993; Nalliah & Idris, 2014). In essence, constructivists propose that individuals create meaning rather than acquire it (Hung, 2001; Richardson, 2003). Constructivist learning theory, therefore, equates learning with students creating meaning by actively filtering inputs from the world through personal interpretation of their lived experiences in the world (Bednar, Cunningham, Duffy & Perry, 1992). This internal representation of perceived knowledge is dynamic and constantly open to change as the student's lived experiences change and expand (Boghossian, 2006; Nalliah & Idris, 2014). The interaction between the student and the environment therefore creates knowledge (Ertmer & Newby, 1993).

Instructors advocating constructivism focus their efforts on the interaction between the student and their environment, with the goal of enabling a student to elaborate on and interpret information from their lived experiences (Ertmer & Newby, 1993). Constructing knowledge in this manner equips a student with the flexible use of pre-existing knowledge for the infinite number of scenarios, which cannot all be anticipated by the instructor (Spiro, Feltovich, Jacobson & Coulson, 1991).

Instructors, therefore, need to accurately portray real world scenarios and tasks for their students, to enable the students to individually construct their knowledge from these experiences (McLeod, 2003). Methods such as experiential learning, case-based learning, self-directed learning may be useful in this regard (McLeod, 2003), as the learning builds understanding through the process of inquiry and reflection. Constructivists emphasize the use of pre-existing knowledge gathered from diverse appropriate sources to create new and situation-specific understandings of the problem at hand (Cronjé, 2006; Terhart, 2003).

Constructivist teaching must focus on creating cognitive tools that reflect the wisdom of the culture in which they are used as well as the insights and experiences of the individuals (Brown, Collins & Duguid, 1989; Cronjé, 2006; Nalliah & Idris, 2014). A student should be guided in how to construct knowledge and shown that numerous different perspectives to

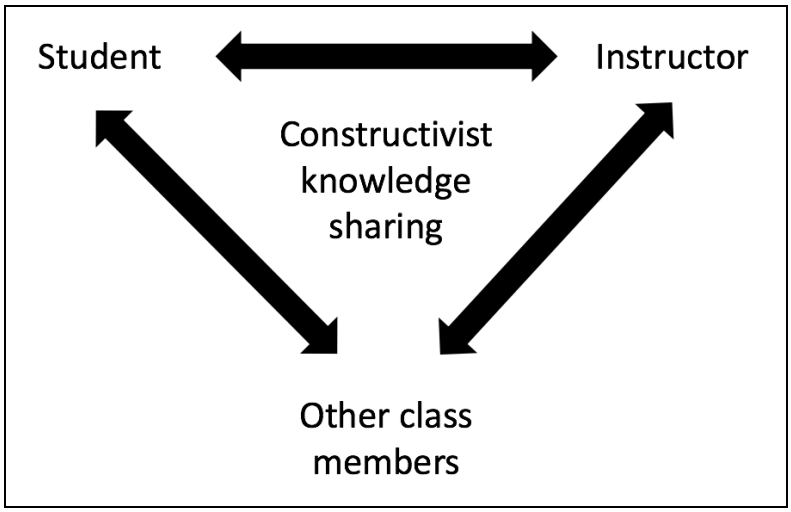
a particular problem may exist (Ertmer & Newby, 1993). Recurring task-engagements, pertaining to a particular concept in various contexts, may result in actions that are repeated and this is likely to increase the efficiency with which subsequent tasks are performed (Brown *et al.*, 1989; Ertmer & Newby, 1993). Constructivism moves away from the instructor being the centre of knowledge, toward the student taking control of the learning process (Boghossian, 2006; Nalliah & Idris, 2014).

In constructivist learning, learning outcomes are not always pre-specified and instruction is not always pre-designed (Ertmer & Newby, 1993). Outcomes are linked to the process of constructing knowledge (Nalliah & Idris, 2014) and are related to a student's lived experiences in realistic real-world situations (Brown *et al*., 1989). Constructivist teaching and learning may be most appropriate when a student has already acquired basic knowledge and is then able to apply conceptual power and problem-solving skills to deal with more complex problems at the higher levels of Bloom's taxonomy (Ertmer & Newby, 1993; Nalliah & Idris, 2014) or Miller's pyramid (Harris *et al*., 2017).

1.4 SOCIAL CONSTRUCTIVISM

In terms of Vygotsky's theory of social constructivism, every conversation or encounter between two or more people, for example between students or between student and their instructor (Figure 1.3), presents an opportunity for new knowledge to be obtained, or current knowledge to be expanded (Vygotsky, 1978). Knowledge is, therefore, formed at an inter-psychological level (between people) before being internalized (Daniels, 2001). The criterion against which to judge the correctness of knowledge created by a student in the social constructivist paradigm, is consensus between people, usually the student and a 'knowledgeable other', achieved through social interaction rather than "a series of predetermined and moderated tasks, marked against clear and agreed criteria" (Adams, 2006:243). Rather than students being assessed and classified as the traditional 'passed' or 'failed', students are regarded as having adequately or inadequately synthesized information to be able to relay a socially acceptable interpretation of the knowledge construct (Cognition and Technology Group at Vanderbilt, 1991). Knowledge creation can, therefore, not be separated from the social environment in which it was formed (Hoy & Woolfolk, 1993).

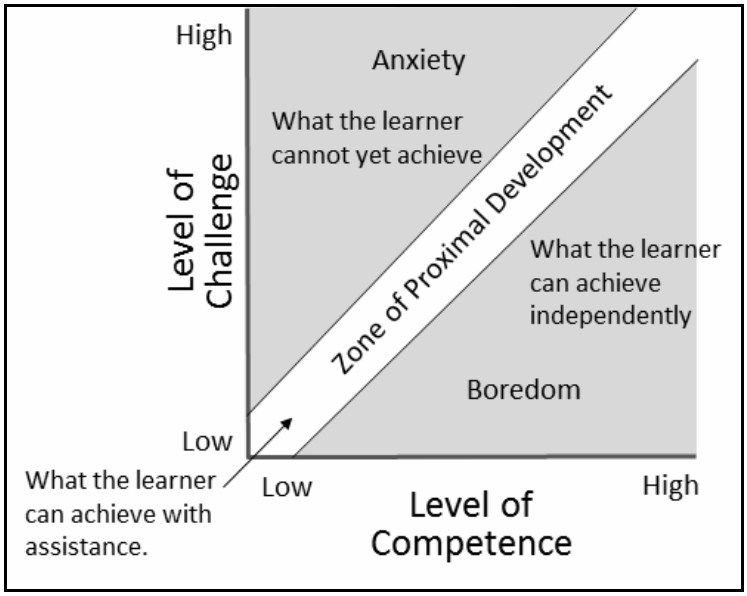
Figure 1-3: Social constructivist interaction



Source: Draper, 2013 (adapted)

Vygotsky identifies two levels of development in a social constructivist learning process. Firstly the 'actual development level' which is what a student understands or can do without being aided by a more 'knowledgeable other' (Kay & Kibble, 2016). Secondly the 'zone of proximal development' (John-Steiner & Mahn, 1996) (Figure 1.4) or what the student can understand or do with the aid of a more 'knowledgeable other' (Subban, 2006). The 'knowledgeable other' may have initially been considered to be an instructor or peer, however, as technology has advanced, this 'knowledgeable other' may be video or audio that supports the student (Kay & Kibble, 2016). The 'knowledgeable other' supports the student in scaffolding the construction of their knowledge or skills towards a socially agreeable interpretation of that knowledge or skill. As the students construct their knowledge or skills and become independent, the 'knowledgeable other' removes the scaffolding.

Figure 1-4: Vygotsky's zone of proximal development



Source: John-Steiner and Mahn, 1996

1.5 RESEARCH AIM AND OBJECTIVE

This thesis aims to report on the use of various approaches to social constructivist accounting education at three stages of competency-based learning namely, facilitating learning, scaffolding learning and assessment for learning (U.S. Department of Education, 2001). In particular, this thesis considers, in respect of:

1) facilitation of learning: students' experience of team teaching in an undergraduate accounting course. In particular the students' perspectives of the relative advantages and disadvantages of teaming, as a form of team teaching, in contrast to the more widely adopted equal status model of team teaching (Chapter 2: Research Paper 1);
2) scaffolding learning: the development of two Messenger bots, Accounting Rookies and IFRS Rookies and potential applications of the Messenger bots in teaching and learning, before exploring students', as end users', preliminary experience of learning with Messenger bots (Chapter 3: Research Paper 2);
3) assessment for learning: the design and use of a team assessment with immediate feedback in a culturally diverse undergraduate professional accounting education course, as a competency-based collaborative learning technique, and the students' qualitative experiences thereof (Chapter 4: Research Paper 3).

1.5.1 Students' experience of team teaching in an undergraduate accounting course (Chapter 2: Paper 1)

When team teaching, instructors operate in each other's 'zone of proximal development' (Smith, 2004) (Illustration 3), and can achieve higher performance levels (Walsh & Elmslie, 2005). In this way, instructors achieve more than working individually (Gardiner & Robinson, 2010; Wenger, 1998). Framed by the socio-constructivist view on learning, the students' learning experience becomes richer when they are confronted by multiple teaching styles and perspectives on the course material (Hanusch, Obijiofor & Volcic, 2009; Nokes *et al*., 2008; Tobin, Roth & Zimmermann, 2001). The students can interact with their teacher team and learn from observing the interaction within their teacher team. The students' experience of the teaming model, which represents the highest level of collaboration in team teaching (Baeten & Simons, 2014), and perhaps the most visible form of team teaching as two instructors are in front of the class actively facilitating at the same time, has yet to be explored. Students' perspectives of team teaching are important, as the students are key actors in the teaching process. Should the advantages of team teaching outweigh the disadvantages, instructors and university policy-makers may be encouraged to more widely adopt team teaching.

1.5.2 The development and the users' experience of two Messenger bots, Accounting Rookies and IFRS Rookies (Chapter 3: Paper 2)

Bots in mobile instant messaging (MIM) applications, such as Facebook's Messenger app, offer opportunities for teaching and learning, particularly to communicate in a more natural and conversive manner, that existing technologies, explored in information communication technology research, do not. Early developers of Messenger bots have found indications of anthropomorphism (Pokatilo, 2016). This refers to the tendency of bot users to treat a bot as another human being. This phenomena may give Messenger bots a crucial advantage over apps and other forms of web-based learning. If the Messenger bot's dialogue and the flow of discussion can closely mimic that of social interaction, it may be possible for the Messenger bot to facilitate social-constructivist teaching and learning (Bii, 2013), through the interaction between the bot and the users. Through careful design, Messenger bots may be able to effectively scaffold students' learning in Vygotsky's 'zone

of proximal development' (John-Steiner & Mahn, 1996). The development of bots in a messaging app, to facilitate teaching and learning and users' experience thereof, has yet to be explored.

1.5.3 The use of a team assessment with immediate feedback in a culturally diverse undergraduate professional accounting education course (Chapter 4: Paper 3)

The realignment of professional education towards increased emphasis on the development of generic transferable skills, requires a change towards a more competency-based approach (Biggs, 1999). Competency-based education, inter alia, requires a broadening of assessment from its traditional focus on knowledge to approaches that integrate the assessment of knowledge, skills, behaviour and attitudes (Harris *et al*., 2017). Competency-based education places substantial focus on the use of formative feedback in assessment for learning (Harris *et al*., 2017). Formative feedback is behaviour- and/or task specific, based on direct observation, allows students to gain a timely awareness of their strengths and weaknesses (Epstein *et al*., 2002) and facilitates learning in a student's 'zone of proximal development' (Chen, Breslow & DeBoer, 2018). The students construct knowledge through the social interaction during the collaborative team assessment. The design of a team assessment with immediate feedback, as a competency-based collaborative learning technique, to develop students' generic transferable skills, in a multicultural professional undergraduate accounting education course, has yet to be explored.

1.6 SUMMARY

The competency-based approach to teaching, learning and assessment has been proposed for accounting education. Constructivism, and in particular social constructivism, provides a theoretical base for this approach. Rooted in social constructivism, this thesis reports on three approaches to social constructivist accounting education. In particular, this thesis reports on students' experience of team teaching in an undergraduate accounting course (Paper 1); the development and the users' experience of two Messenger bots, Accounting Rookies and IFRS Rookies (Paper 2); and the use of a team

assessment with immediate feedback in a culturally diverse undergraduate professional accounting education course (Paper 3). This thesis is submitted in the form of three research articles (Chapters 2 - 4), each with its own reference list. Thereafter the thesis is concluded (Chapter 5).

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2 CHAPTER 2: UNDERGRADUATE STUDENTS' PERSPECTIVES OF THE TEAMING VERSUS EQUAL STATUS MODEL OF TEAM TEACHING IN ACCOUNTING EDUCATION

2.1 INTRODUCTION

This study explores how students experience team teaching in an undergraduate accounting course. In particular, this study explores the students' perspectives of the relative advantages and disadvantages of teaming, as a form of team teaching, in contrast to the more widely adopted equal status model of team teaching.

While definitions of team teaching vary (Lee, 2013), team teaching generally involves two or more teachers sharing responsibility for a specific course and student group (Wenger & Hornyak, 1999) and collaborating to varying degrees in lecture planning and delivery and course assessment (Baeten & Simons, 2014). Team teaching encourages teachers' creativity and the construction of new knowledge about teaching through learning from each other as they plan, teach and assess collaboratively (Kerin & Murphy, 2015; Murphy & Scantlebury, 2010; Roth & Tobin, 2002). Exactly how responsibilities pertaining to planning, delivery and assessment are shared differs according to the specific context and is dependent upon curricula, student needs, availability of faculty and financial constraints (Robb & Gerwick, 2013).

While team teaching may enhance the teaching experience for teachers (Barahona, 2017; Knights & Sampson, 1995), it may also enhance the learning experience for students beyond mere knowledge accumulation (Shibley, 2006). Students may receive more timely feedback (Fuller & Bail, 2011) and be more engaged in the classroom (Donnison *et al*., 2009). Realising these advantages of team teaching for students may assist higher education institutions avoid the costs associated with extended periods of study by contributing towards improving student throughput and completion rates (Crawford & Jenkins, 2018).

The most prevalent team teaching model in higher education is the equal status model (Colburn, Sullivan & Fox, 2012; Money & Coughlan, 2016; Murawski, 2005). In this model, content, activities and/or student groups are divided amongst the teachers in the team (Baeten & Simons, 2014). Each teacher, therefore, takes responsibility for individually delivering content to a specific student group, however, shares responsibility for overall course and lecture planning and the teachers share textbooks, lecture plans and exercise problems. Assessment of the course is then usually a team effort with each teacher contributing content to the assessment, while moderating the content contributed by the other team member(s).

The teaming model represents the highest form of collaboration in a teacher team. The teaming model involves both teachers sharing responsibility and working collaboratively (Carpenter, Crawford & Walden, 2007) in the planning and delivery of the course and the lectures, and in matters relating to assessment (Austin, 2001; Carpenter, Crawford & Walden, 2007; Goodnough *et al*., 2009; Nevin, Thousand & Villa, 2009; Thousand, Villa,Nevin, 2006). Both teachers facilitate the lecture, with extensive interaction, discussion and debate between them (Al-Saaideh, 2010; Helms, Alvis & Willis, 2005). The teachers may for example discuss ideas and theories in class (Al-Saaideh, 2010), taking turns in leading any subsequent discussion. Alternatively, one teacher may speak while the other demonstrates a concept or model (Cook & Friend, 1995). The teaming model has not been specifically explored in any context. This study, therefore, explores how students experience teaming as a form of team teaching and contrasts this with the equal status model. In particular, this study explores the students' perspectives of the relative advantages and disadvantages of teaming, in contrast to the more widely adopted equal status model. In other words, are there differences in students' perspectives of having one member of a teacher team in class (equal status) as opposed to both team members in class simultaneously (teaming)?

2.2 LITERATURE REVIEW

2.2.1 Theoretical base

Team teaching, both the equal status and teaming model, is anchored in social constructivism (Vygotsky, 1978) and Lave and Wenger's (1991) notion of situated learning. Social constructivists posit that learning is a social-based process, where social interaction between people facilitates knowledge construction and the creation of meaning in solving authentic problems (Vygotsky, 1978). Often times these interactions occur between people in the community of practice of a work environment. Therefore, according to Wenger (1998:1), "engagement in social practice is the fundamental process by which we learn". A person's knowledge is created and skills developed or refined through "engaging in and contributing to the practices of their communities" (Wenger, 1998:7). Through dialogue and interaction with others, meaning is negotiated and relationships built towards a common purpose (Wenger, 1998). Therefore, through sharing ideas, offering alternative insights and perspectives and receiving advice about teaching, in the sociocultural setting of an education institution, teachers construct their knowledge of teaching and develop their teaching practices with the goal of improving student learning (Baeten & Simons, 2014; Guise, Habib, Thiessen & Robbins, 2017).

By participating and engaging in team teaching, teachers learn at both the professional (e.g. teaching skills) and personal (e.g. self-confidence) levels (Baeten & Simons, 2016; Birrell & Bullough, 2005; King, 2006). When team teaching, teachers operate in each other's 'zone of proximal development' (Smith, 2004), and can achieve higher performance levels (Walsh & Elmslie, 2005). In this way, teachers achieve more than working individually (Gardiner & Robinson, 2010; Wenger, 1998). The 'zone of proximal development' (John-Steiner and Mahn, 1996) is what a person can understand or do with the aid of a more 'knowledgeable other' (Subban, 2006). The 'knowledgeable other' supports the person in scaffolding the construction of their knowledge and development of their skills towards a socially agreeable interpretation of that knowledge or skill. As the person constructs their knowledge or skills and becomes independent, the 'knowledgeable other' removes the scaffolding.

2.2.2 Advantages and disadvantages

In addition to teachers refining their teaching practice, the students' learning experience becomes richer when they are confronted by multiple teaching styles and perspectives on the course material (Hanusch, Obijiofor & Volcic, 2009; Nokes *et al*., 2008; Tobin, Roth & Zimmermann, 2001). When an additional teacher is present in class, students can learn by observing their teacher team's interactions and by interacting and collaborating with their teacher team (Topping, 2005). Students can also receive quicker assistance (Gardiner, 2010), support, and more individual attention when an additional teacher is present (Birrell & Bullough, 2005). The additional teacher also creates opportunities for greater differentiation of instruction, additional observational information (e.g. learning problems) (Baeten & Simons, 2016; Bullough *et al*., 2002; Gardiner, 2010; Smith, 2004), and improved classroom management (Birrell & Bullough, 2005). Ultimately, team teaching may lead to learning gains for the students, increased test scores, and higher quality learning activities (Benjamin, 2000; Colburn, Sullivan & Fox, 2012; Sorensen, 2004).

Team teaching, though, may have some disadvantages for the students. Students may become confused when faced by more than one teacher in a class, particularly when the teachers give differing instructions and differing responses to the same question (Baeten & Simons, 2016). Students may also be confused which of the teachers to approach with any questions (Bullough *et al*., 2003; Goodnough *et al*., 2009; Kamens, 2007).

The most commonly raised concern, in respect of adopting team teaching, from the teachers' and universities' point of view, is the notion of duplication of work, the consequent increase in teaching hours, and the associated cost thereof (Buckley, 1999; Henderson, Beach & Famiano, 2009; Higgins & Litzenberg, 2015; Liebel, Burden & Heldal, 2017; McDaniel & Colarulli, 1997; Plank, 2011). The cost of the additional teaching hours may, however, be justified by the advantages of team teaching and their positive effect on student learning. In some instances, these benefits may so significantly outweigh the cost thereof that institutions may elect to budget for additional teaching hours (Henderson, Beach & Famiano, 2009). Alternatively, it has been suggested that institutions acknowledge the social capital benefits of team teaching and budget these against training costs, not only teaching costs (Burden, Heldal & Adawi, 2012).

Many of the advantages and disadvantages of team teaching have been established through the lens of teachers, less is known of the students' perspective (Baeten & Simons, 2016). The students' experiences and preferences of team teaching in higher education is limited to comparing the equal status model (parallel, tag rotation or sequential approach[4]) and the traditional individual teacher model (Colburn, Sullivan & Fox, 2012; Money & Coughlan, 2016), with many respondents expressing a preference for individual teaching rather than the equal status team teaching model. Many of the advantages of team teaching, particularly those visible to students when teachers collaborate in class, may be less evident to students experiencing the equal status model of team teaching. The rotation of teachers in the equal status model may nullify the advantages of courses facilitated by an individual teacher, such as consistent delivery of the course content, and students becoming familiar with the individual teacher's teaching style (Money & Coughlan, 2016).

The students' experience of the teaming model, which represents the highest level of collaboration in team teaching (Baeten & Simons, 2014), and perhaps the most visible form of team teaching as two teachers are in front of the class actively facilitating at the same time, has yet to be explored. Students' perspectives of team teaching are important, as the students are key actors in the teaching process. Should the advantages of team teaching outweigh the disadvantages, teachers and university policy-makers may be encouraged to more widely adopt team teaching.

[4] Parallel teaching involves each teacher teaching the same course content to different subgrouping of students within a course. In tag rotation or sequential teaching, the course content is divided amongst the teachers (Money & Coughlan, 2016). Each teacher facilitates the same lecture to all students enrolled in the course, but each teacher is responsible for a different content area within the course (Carpenter, Crawford & Walden, 2007).

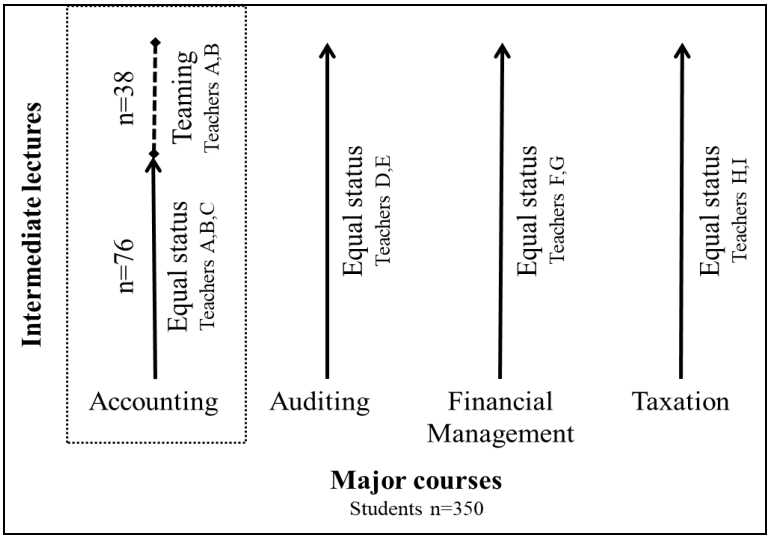
2.3 METHOD

2.3.1 Research context

This study was conducted in an undergraduate accounting education programme at a large full-time residential South African university. The study considered two cases of team teaching as they represented two distinct team teaching models, experienced by the same group of 350[5] undergraduate intermediate accounting students (gender: 209 female; 141 male, age: between the ages of 20 - 21). In the first case, these students experienced the equal status (parallel and tag rotation) model (76 accounting lectures) - being the model traditionally preferred by the School of Financial Sciences (School) that provided the context to this study. Thereafter the students experienced the teaming model (38 accounting lectures). While accounting was presented using the equal status and teaming models, teacher teams using the equal status model presented the students' other three major courses (auditing, financial management and taxation). Typically, from first to third year level, each course is presented by a team of two to three teachers (Figure 2.1). The large number of accounting lectures for each team teaching model, ensured that in each case a broad spectrum of content and skills was covered or developed. The difference between the two cases allowed comparative analysis of the different forms of team teaching, experienced by the same group of students.

[5] The response rate was 71% (n=350 of 491 enrolled students). To explore for possible non-response bias, a comparative analysis of the profile of the respondent group and the targeted population revealed no significant differences in terms of the respondent gender and age (untabulated). Despite this, the potential for non-response bias should be considered when interpreting the results.

Figure 2-1: Research context



2.3.2 Research instrument

To provide each student the opportunity to give their perspective, a survey instrument, developed by Baeten & Simons (2016), consisting of 14 statements (Table 2.1) and two open-ended questions, for both the teaming and the equal status model, was distributed to the students. The survey instrument was distributed to the students after approval by the Institutional Review Board (IRB) of the university and after the students had experienced both team teaching models. The statements included in the survey instrument were identified in the literature (see Baeten & Simons, 2014) and the students' agreement with the statement is measured on a Likert scale ranging from 1 (completely disagree) to 5 (completely agree). The students were informed that the purpose of the survey was to contrast the two team teaching models. Further, the 14 statements were preceded by "Because we were taught by two lecturers simultaneously …" for the teaming model and "Because we were taught by each lecturer separately …" for the equal statement model. Additionally, two open-ended questions were posed to the students:

(1) Would you like to be taught in this way in the future? Why (not)?

(2) Give at least one advantage and one disadvantage of the specified teaching model.

To confirm the underlying data structure of the statements included in the survey instrument (Baeten & Simons, 2016), an exploratory principal axis factor analysis was conducted on the 14 items, with oblique rotation (direct oblimin). The sampling adequacy

for the analysis was verified by the Kaiser-Meyer-Olkin (KMO) measure (KMO=.919 (teaming) and .916 (equal status)) and all KMO values for individual items were greater than .822 (teaming) and .799 (equal status). An initial analysis was run to obtain eigenvalues for each factor in the data. Two factors for teaming had eigenvalues over Kaiser's criterion of 1 and in combination explained 48.213% of the variance. Similarly, for equal status, two factors also had eigenvalues over Kaiser's criterion of 1 and in combination explained 53.401% of the variance. The scree plots showed inflexions that would justify retaining two factors for both teaming and equal status. Table 2.1 shows the factor loadings after rotation. The items that cluster on the same factor suggest that factor 1 represents advantages (10 items) and factor 2 disadvantages (4 items). The advantages and disadvantages of teaming and equal status all had high reliabilities (Cronbach's α > than .7) (Field, 2013).

Table 2-1: Results of the principal axis factor analysis

Factor	**Factor loading teaming**	**Factor loading equal status**	**Statement** ***Because we were taught by two lecturers simultaneously…/*** ***Because we were taught by each lecturer separately…***
Factor 1 Advantages			
	.740	.723	I understood the course contents more quickly
	.724	.766	The lectures were more interesting
	.720	.778	I received support faster
	.701	.713	I remembered more from the lecture
	.699	.738	It was easier for me to concentrate
	.689	.668	The atmosphere was more relaxed
	.674	.700	I paid more attention during the lecture
	.656	.773	I received more (individual) attention
	.611	.645	It was noticed more quickly that I did not understand something
	.513	.601	I dared to ask questions more quickly
Cronbach's α	.908	.922	

Factor 2 **Disadvantages**			
	.703	.651	It was more difficult for me to pay attention
	.682	.677	I sometimes missed some structure in the lecture
	.591	.696	Time was unnecessarily lost
	.347	.515	Learners chatted more among each other
Cronbach's α	.700	.746	

Qualitative thematic analysis was used to explore the students' responses to the open-ended questions by using a coding scheme (Silverman, 2005). The development of the coding scheme was initially based on the advantages and disadvantages of team teaching evident in the team teaching literature, as listed in Table 2.1. Additional codes were then added when new themes were identified in the data. The most populated categories of advantages and disadvantages are indicated in Table 2.4.

2.4 RESULTS

Descriptive statistics for the two factors (advantages & disadvantages) suggest that the respondent students assessed both the teaming model and the equal status model positively (Table 2.2). The students were, however, significantly more positive about the advantages of the teaming model (M=3.52) as opposed to the equal status model (M=3.12) (F=3.321, p=0.000). *"Individual teaching [equal status] is like the standard and combined [teaming] like an 'upgrade'"* (Respondent student). Teaming is "*... more interactive. It's less stressful. It's more fun. It's more dynamic*" (Respondent student). The majority of the respondent students (n=275, 79%) indicated that they would like to be taught using the teaming model in the future, while a smaller majority (n=190, 54%) indicated that they would like to be taught using the equal status model in the future (Table 2.3). Although a form of team teaching, in the equal status model the teamwork component thereof may be less visible to the students, as only one teacher is present in class at a time. The evaluation of the disadvantages of the teaming model (M=2.47) and equal status model (M=2.45) were similar (F=0.277, p=0.769).

Table 2-2: Quantitative analysis of the (dis)advantages by team teaching model

	Teaming		Equal status		
	M	**SD**	**M**	**SD**	**p**
Advantages	3.52	0.772	3.12	0.836	0.000
I dared to ask questions more quickly	2.97	1.053	3.01	1.043	0.353
The lectures were more interesting	3.86	1.072	3.05	1.079	0.000
The atmosphere was more relaxed	3.73	1.032	3.15	1.103	0.000
It was easier for me to concentrate	3.49	1.046	3.41	1.156	0.000
I received more (individual) attention	3.41	1.133	2.63	1.086	0.001
I received support faster	3.85	0.984	2.73	1.078	0.000
I understood the course contents more quickly	3.38	1.050	3.35	1.048	0.000
It was noticed more quickly that I did not understand something	3.21	1.066	3.02	1.150	0.284
I paid more attention during the lecture	3.63	0.971	3.37	1.102	0.000
I remembered more from the lecture	3.63	1.026	3.43	1.046	0.000

	Teaming		Equal status		
	M	**SD**	**M**	**SD**	**p**
Disadvantages	2.47	0.887	2.45	0.913	0.769
Learners chatted more among each other	2.59	1.212	2.72	1.258	0.045
It was more difficult for me to pay attention	2.20	1.206	2.53	1.245	0.013
I sometimes missed some structure in the lecture	2.76	1.248	2.48	1.196	0.773
Time was unnecessarily lost	2.32	1.223	2.06	1.111	0.668

Table 2-3: Student preference by team teaching model

Would you like to be taught this way again in future...	**Teaming**		**Equal status**	
	n	**%**	**n**	**%**
Yes	275	79	190	54
No	66	19	121	35
Impartial / No response	9	2	39	11
Total	350	100	350	100

Table 2-4: Qualitative analysis of the (dis)advantages by team teaching model

Teaming	Equal status
Advantages (n=265)	**Advantages (n=219)**
The lectures were more interesting (n=158, 60%)	Lectures were structured (n=133, 61%)
I received support faster (n=44, 17%)	It was easier for me to concentrate (n=30, 14%)
I understood the course contents more quickly (n=39, 15%)	I understood the course contents more quickly (n=30, 14%)
I received more (individual) attention (n=24, 8%)	I paid more attention during the lecture (n=26, 11%)
Disadvantages (n=186)	**Disadvantages (n=212)**
I sometimes missed some structure (n=135, 73%)	Only one teaching style or opinion on content was available (n=94, 44%)
It can become confusing (n=69, 37%)	I received less (individual) attention (n=63, 30%)
It was more difficult for me to pay attention (n=31, 17%)	It was more difficult for me to pay attention (n=55, 26%)

2.4.1 Teaming lectures are interesting and engaging

The respondent students agreed that the teaming lectures were interesting (M=3.86) with many commenting on this, when responding to the open-ended questions (n=158, 60%). Of the students that commented that the lectures were more interesting, many respondent students (n=124, 47%) ascribed this to being confronted by "*different teaching styles*" and that *"[t]he same work can be explained from different perspectives which can increase the students' understanding"* (Respondent student) because "*[i]f you did not understand the way one lecturer explained the work, the other lecturer can explain it in a different way for you to understand*" (Respondent student). The students were more neutral in their perception of the equal status model lectures being interesting (M=3.05) with the difference between the two models being statistically significant (p=0.000). The most commonly mentioned disadvantage of the equal status model was that the students could only experience one teaching style and receive one opinion on the content (n=94, 44%). A respondent student commented that *"the two lecturers working together provided me with more points of view and chains of thought when approaching the work. Allowing me to choose the one I feel most comfortable with".*

In addition to perceiving the teaming lectures as being more interesting than the equal status lectures, many students commented that it was more difficult for them to pay attention in the equal status class (n=55, 26%), with the group as a whole agreeing more strongly that they paid attention in the teaming class (M=3.63) than in the equal status class (M=3.37), with this difference being statistically significant (p=0.000). A respondent student commented that *"[m]y focus is heightened more because there's a variation of voice projection and teaching style".*

2.4.2 Teaming lectures provide faster and more individualised support

The respondent students more strongly agreed that they received support faster in the teaming lectures (M=3.85) than the equal status lectures (M=2.73) with the difference between the two models again being statistically significant (p=0.000). Many respondent students also commented that in the teaming lectures, they received quicker assistance and more individual attention (n=24, 8%) as *"[t]eam teaching offers the ability for the one lecturer to teach while the one answers questions*" (Respondent student). However, two respondent students commented that the individual questions asked and the individual attention provided, did prevent other students from learning from the question asked and the response provided that could not be heard by the entire group.

2.4.3 Teaming lectures may be confusing, intimidating and less structured

In terms of the disadvantages of the teaming model, students commented that they missed some structure in the lecture (n=135, 73%) and, in particular, became confused when faced with more than one teacher in class (n=69, 37%). For example, *"[i]t can be confusing if the two lecturers phrase things differently in the same class*" (Respondent student) and "*having two different explanations on the same work can sometimes be confusing*" (Respondent student). Further, it appears from the respondents' comments that some students experienced difficulty in creating knowledge and meaning from different opinions and approaches to solving particular problems. A respondent student commented that it "*sometimes feel[s] as if lecturers do not agree on everything the other one has said. And that makes it harder to understand*". Confusion is the most reported disadvantage in the

team teaching literature (Baeten & Simons, 2016; Bullough *et al.*, 2003; Goodnough *et al.*, 2009; Kamens, 2007; Liebel, Burden & Heldal, 2017; Nokes *et al.*, 2008). Some respondent students (n=13, 7%) commented that "*it is slightly intimidating*" having more than one teacher present in class.

To mitigate these disadvantages, teachers may consider explaining to students their motivation for having more than one teacher in class. Teachers may consider the use of occasional surveys to source student feedback on the functioning of the teaming model. After consideration of this feedback, teachers should communicate to the students why some suggestions have been adopted and others not. It should, however, be kept in mind, that confusion may be a part of learning (D'Mello, Lehman, Pekrun & Graesser, 2014) and any negative student feedback should be interpreted in light of this.

2.5 DISCUSSION AND CONCLUSION

The results suggest that there are differences in the students' perspective of the teaming and equal status model of team teaching. The students have expressed a preference for the teaming model of team teaching, where two or more teachers are simultaneously present in class, as this model appears to provide students with lectures that are, from their perspective, more interesting with faster and more individualized support than the equal status model (only one teacher present in class at a time). However, in adopting the teaming model, teachers should consider sources of possible confusion and intimidation. Particular attention may need to be given to the facilitation, presentation, discussion and debate of divergent views during the delivery of the lectures. Additionally, teachers should pay attention to mitigating the intimidation effect of a team of teachers present in class at the same time.

Given that, from the students' perspective, the teaming model appears to maximise the advantages of team teaching, teachers and university policy-makers should consider adopting the teaming model, above the equal status team teaching model *ceteris paribus*. However, a particular concern of institutions, pertaining to team teaching, is the cost associated with the duplication of work (Liebel, Burden & Heldal, 2017) which may be magnified in the teaming model that requires two teachers consistently present in class.

Institutions should, however, consider the students' positivity towards the teaming model of team teaching and the advantages of the teaming model, including the potential for increased student interest and understanding, and more individualised support, particularly in large student groups of diverse academic ability.

Despite the apparent benefits of the teaming model, as perceived by the students, possibly contributing to a more conducive learning environment, as the students could be supported individually and their interest in class maintained, this may not necessarily transfer into actual learning gains. Future research directly exploring and contrasting students' actual knowledge gains and skills development in each team teaching model is encouraged, possibly by means of a randomized control trial with pre- and post testing. Future research should, however, not be restricted to summative measures, but also consider formative evidence supporting the social construction of knowledge and the development of skills as a result of two teachers presenting a lecture collaboratively. Additionally, future research may explore whether, or not, there are differences between various demographic student groups' preference for a particular team teaching model.

The present study was limited by the differing number of lectures per case. Consequently, the design was unbalanced, as the School involved largely applies the equal status model. Replicating this study with a balanced design and in different contexts would strengthen the results and the generalizability thereof. Further, the results reported may be influenced by an element of recency as the teaming lectures for this particular course followed the equal status lectures. However, outside of this course, the students would have continued to encounter equal status teaching in their other courses, while experiencing teaming in the accounting course, as the equal status model is traditionally the School's preferred team teaching model. Additionally, the novelty of the teaming model may have affected the students' perspective thereof and consequently the results reported. Subsequent research of the teaming model, following wider adoption thereof, may enhance the generalizability of the results reported in this study beyond the initial adoption of the teaming model.

Finally, given the paucity of research on the teaming model, future research exploring teachers' experiences is encouraged to provide guidance for refining teaming practices

and to provide institutions and policy-makers with additional evidence supporting the adoption, or not, of teaming as a team teaching model.

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3 CHAPTER 3: THE DEVELOPMENT OF MESSENGER BOTS FOR TEACHING AND LEARNING AND ACCOUNTING STUDENTS' EXPERIENCE OF THE USE THEREOF

3.1 INTRODUCTION

The purpose of this study is to provide a thick description[6] of the development of two Messenger bots, Accounting Rookies (https://m.me/accountingrookies) and IFRS Rookies (https://m.me/ifrsrookies). These Messenger bots are designed to act as virtual 'tutors' for introductory (Accounting Rookies) and intermediate (IFRS Rookies) accounting students. This study then documents potential applications of the Messenger bots in teaching and learning, before exploring students', as end users', preliminary experience of learning with the Messenger bots.

Bots are artificial narrow intelligence[7] (ANI) programs designed to interact through text, or voice, with users in a human-like way, answering questions and performing tasks (Abushawar & Atwell, 2007; Bii, 2013) by harnessing the power of machine learning and cognitive engines such as Watson (by IBM) (McFarland, 2016). At present though, given the complexity of ANI technology, the vast majority of bots rely more simplistically on menu prompts to guide discussion and/or a database of information triggering automated responses to user inputs (Miller, 2016). There has been a significant growth in the number of these more simplistic bots since Facebook, in particular, enabled, in April 2016, the functionality that these bots could use Facebook's mobile instant messaging application (MIM app), Messenger, to interact with users on their mobile devices. Bots interacting with users through Messenger, as opposed to a standalone platform, are referred to as Messenger bots. Other popular messaging applications supporting bot integration include, *inter alia*, Slack and Telegram.

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[6] 'Thick description', first adopted by Geertz (1973), is a way of writing that includes not only description and observation but also context. In terms of Bloom's taxonomy, a 'thick description' gives the reader knowledge of a phenomena and then explains it, to enable the reader to comprehend the phenomena. Examples of the application are then provided, before analyzing and evaluating the phenomena.

[7] Artificial narrow intelligence (ANI) is the only form of Artificial Intelligence that humanity has managed to achieve to date. ANI can perform a single task, such as making purchase suggestions, sales predictions and weather forecasts.

The development of bots, designed to interact with users in MIM apps, was motivated by two recent occurrences. Firstly, the use of mobile devices now exceeds the use of desktop computers to access the Internet (Hart, 2016). Secondly, people are now spending more time using MIM apps on their mobile device than social networks (BI, 2016; Hart, 2016). MIM apps may therefore be the platform of the future, through which users will access services provided by bots, rather than by other mobile apps (Schlicht, 2016). Where users have in the past had to download, log into, and update several apps separately, bots in MIM apps are readily and conveniently available within a MIM app and are always up to date (Miller, 2016).

The use of MIM apps as a learning tool may enhance student learning (Chuang & Tsao, 2013; Rambe & Bere, 2013; So, 2016; Srdanovic, 2017; Sun *et al.*, 2018) despite the fact that students may multitask and be distracted by unrelated messages (Bowman, Levine, Waite & Gendron, 2010; Junco & Cotten, 2011). It is natural for today's students to receive motivational messages, get reminders about upcoming tests, seek answers to study questions, or find another student revising the same topics, through MIM apps (Timmis, 2012). Affordances of MIM apps such as flexible use, continuity of use, timely feedback, personalization, socialization, active participation, peer coaching, and self-evaluation promote opportunities for social constructivist based collaborative learning, through enabling productive conversation and collaboration between the student and knowledgeable others, including their instructors and fellow students (Kukulska-Hulme & Viberg, 2018). While offering potential as a learning tool, the use of MIM apps in teaching and learning is constrained by instructors' reluctance to merge academic and family life through after hours MIM consultations with students (Rambe & Bere, 2013). Further, class size may also constrain the use of MIM apps for learning, as instructors cannot reasonably engage constructively with every student in a large class individually via MIM apps. Some potential for engaging with the group of students collectively exists within the 'Group chat' function of many MIM apps. However, this results in students receiving generic feedback and mass communication rather than facilitating social constructivist learning opportunities between the instructor and a student.

Unlike a fellow student or instructor, bots in MIM apps are able to offer help on demand and are always ‘at the other end of the line’. Bots interacting with users in a MIM app may, therefore, offer instructors an alternative, automated, means of content delivery and instruction (Nakpodia, 2017; Riel, 2016). Bots in MIM apps are ideally placed to fulfil the roles of inter alia, motivator, advisor, or assistant in a student’s learning (Pokatilo, 2016). Asking questions and getting help from a bot in a MIM app can be beneficial in other ways too. Some students may be anxious about asking instructors questions directly and may prefer interacting with a bot in a MIM app (Riel, 2016). This may again be useful in large classes where students are not always able to get full attention or help from the instructors easily when they face problems (Dean & Wright, 2017), which may end up causing frustration and demotivating students and may discourage the students from asking further questions or seeking additional clarification from the instructors (Dean & Wright, 2017). On the other hand, the instructors may also feel overwhelmed by many enquiries from students at one time (O'Flaherty & Phillips, 2015). Moreover, if the same question is asked by many different students, it is inefficient for the instructor to repeat the answer frequently. Bots in MIM apps could assist in these circumstances. Instructors can review the bots’ chat history and sift through the more meaningful questions and address these questions with students (Riel, 2016) or enable the bot to personally respond to these questions at the appropriate time in a particular student’s learning.

Despite the significant potential for automated personalized learning and differentiated instruction offered by bots in MIM apps (Pokatilo, 2016; Riel, 2016) there are at present few educational bots in MIM apps and the focus of research into educational bots is on the more complex stand-alone bots, functioning independently of MIM apps (see for example: Akcora *et al.*, 2018; Bii, Too & Langat, 2013; Burbules, Blanken-Webb, Herrera, Shipman & Stewart, 2013; Heller, 2017). There is no formal research, outside of the popular media (see for example Srdanovic (2017, 2018)), exploring the use of bots in MIM apps, and in particular Messenger bots, in teaching and learning. Despite being less advanced than standalone bots in terms of ANI processing of user intent, Messenger bots are easier for instructors, who may lack coding skills, to develop (Srdanovic, 2018), particularly when considering that there are many visual development tools to assist in developing the Messenger bots. This study is the first to explore and report on the development and use of Messenger bots to support and facilitate teaching and learning. In this study,

collaborative learning involves the student interacting with the bot to construct their knowledge of accounting.

3.2 MESSENGER BOTS AND LEARNING THEORY

In developing a bot, including a Messenger bot, it is important to maintain a strong commitment to learning theories and design principles that are known to foster constructive learning, rather than merely encouraging behaviourist rote memorization and drilling activities (Riel, 2016).

3.2.1 Social constructivism theory

The affordances of collaborative learning with bots, is framed by social constructivism. In terms of Vygotsky's theory of social constructivism, every conversation or encounter between two or more people presents an opportunity for new knowledge to be obtained, or current knowledge to be expanded (Powell & Kalina, 2009). Although users may be aware that they are chatting with a bot, early bot developers found indications of anthropomorphism (Pokatilo, 2016). That is the tendency of bot users to treat a bot as another human being. This phenomena may give bots an advantage over apps and other forms of web-based learning. If the bot's dialogue and flow of content and discussion can mimic that of social interaction, it may be possible for the bot to facilitate social-constructivist teaching and learning (Bii, 2013), particularly where the bot engages with students in a MIM app.

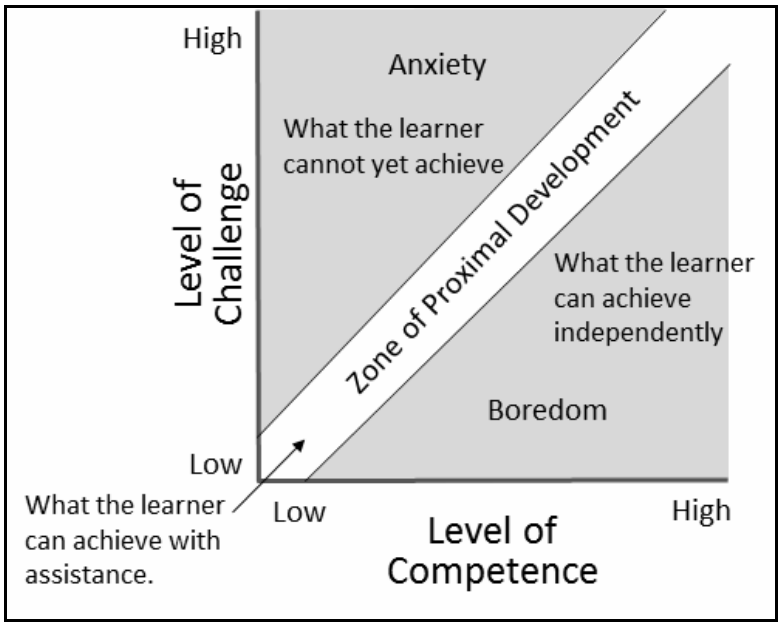
3.2.2 Instructional mediation

Beyond social interaction, bots have potential to facilitate basic instructional mediation (Bii, 2013). Bots provide an engaging and intuitive interface to a body of knowledge that can be accessed in a personalized and adaptable format (Cassell, Sullivan, Prevost & Churchill, 2000). Through their social interaction and connection to a body of knowledge, bots could empower students to develop their self-knowledge and become independent, self-directed learners, constructing knowledge by connecting "the external and the internal, the social and the individual" (John-Steiner & Mahn, 1996:4). Through careful design, bots may

scaffold and differentiate students' learning in a student's 'zone of proximal development' (Figure 3.1). This may be particularly the case in courses with a hierarchical structure (Dempster, 1989; Schneider, Hein & Murphy, 2014), like accounting, where topics build directly on earlier course topics.

Messenger bots may engage students and support, or scaffold, their progression through course material, at their own pace in and outside of the class in bite-sized chunks, using, for example, video, animated GIF images, and text-based explanations. Messenger bots can also differentiate between students. Based on a discriminator, for example a response to a particular prompt while chatting through an interactive example, a Messenger bot can offer a student the most appropriate information or learning experiences relevant to that student's particular learning needs, as identified by their response to that particular prompt.

Figure 3-1: Vygotsky's zone of proximal development



Source: John-Steiner & Mahn, 1996

Retention of new knowledge constructed may degrade if not revised regularly, however, revision in large volumes may not be effective (Stahl *et al*., 2010). Messenger bots enable students to selectively revise content in bite-sized chunks at a convenient pace and time. Traditionally, students learning with MIM apps would need to review the chat history, if stored, chronologically in order to revise the material (So, 2016). Bots are, however, always available and able to repetitively deliver relevant content to the student on demand.

3.3 DEVELOPMENT OF ACCOUNTING ROOKIES AND IFRS ROOKIES MESSENGER BOTS

To inform the discussion on the development of the Messenger bots, the developers, as 'complete participants' (Gold, 1958) in the development process, relied upon their development notes, personal experiences, conversations and reflections during the period prior to and since the launch of the Messenger bots.

3.3.1 Initial development

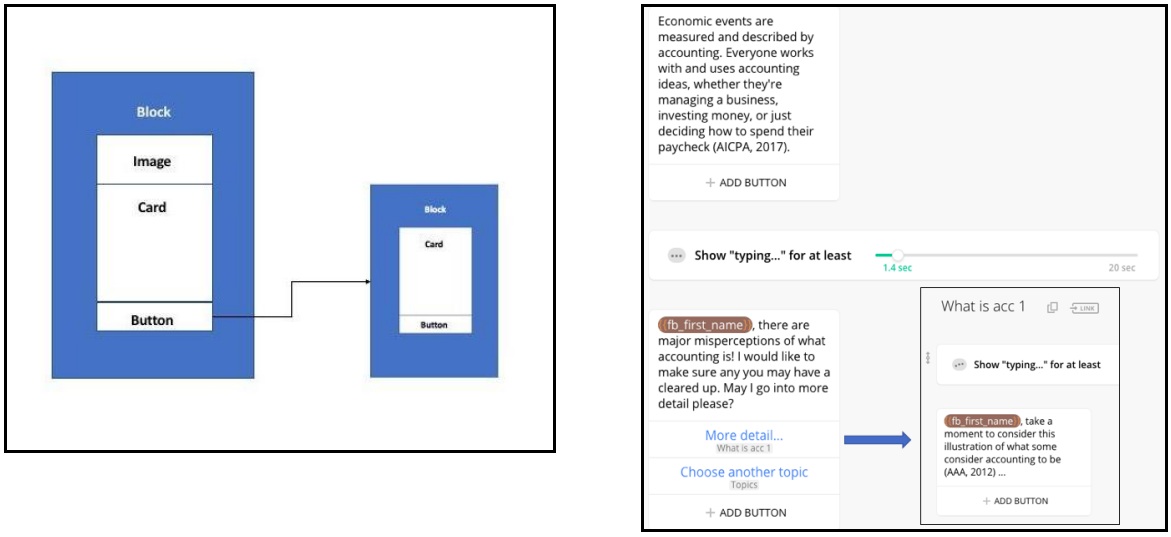
In December 2016, the idea to build a Messenger bot as a tutor and student assistant was conceptualized. The Accounting Rookies and IFRS Rookies Messenger bots were connected to Messenger in April and February 2017 respectively. The content of the Messenger bots was not regarded as complete at launch. Unlike an app, the content of a Messenger bot is not downloaded to a user's device and does not require subsequent updates. The content remains available online and is accessed by users on demand. Updates, including additional content, are immediately available to users. Both Messenger bots were designed to be interactive, friendly and above all, facilitate learning of Accounting and International Financial Reporting Standards (IFRS) at an introductory and intermediate level respectively. The Messenger bots were initially 'tested' by informing students, that were enrolled for courses for which the bots were developed, about the bots, encouraging them to engage with the bots and then monitoring these interactions.

Not having a coding background, Chatfuel was selected as the tool to develop the Messenger bots. Chatfuel is a Messenger bot builder that is free and has a visual development environment, allowing the results of the bot development, rather than a screen of code, to be seen. For building Messenger bots, the Messenger Send/Receive API[8], accessed through Chatfuel, offers, inter alia, support for: defining a welcome screen for setting the context and different controls; sending and receiving text, images and interactive bubbles containing multiple calls-to-action; and possible integration with a more

[8] An application-programming interface (API) is a set of coding instructions and standards for accessing a Web-based software application or Web tool (See Gazarov, 2016).

advanced ANI engine or the more simplistic database of prepopulated responses for interpreting the users' intent from their inputs. These development options are presented visually by Chatfuel as a series of connected blocks. A block is the basic 'building block' of a Messenger bot. It consists of one or more message cards that are sent together to the user. Each card may have a button or quick reply bubble that links to the next block (Figure 3.2).

Figure 3-2: Message blocks



Replicable instructions for the initial development of a Messenger bot with Chatfuel are included in Appendix A.

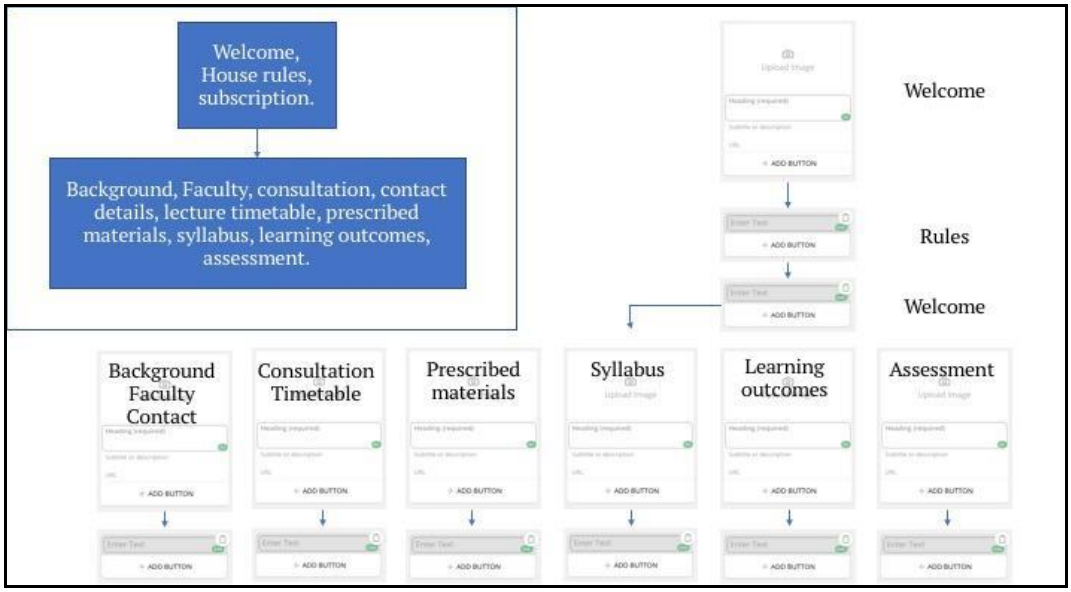
3.3.2 Content

Before adding content to the Messenger bots, a basic content map for each bot was created (Figure 3.3 Panel A). This assisted visualisation of the communication flow. Informed by social constructivist learning and the scaffolding of students' learning in their zones of proximal development, the technical content of the Messenger bots was mapped to take advantage of the hierarchical nature of accounting (Figure 3.3 Panel B). Students are enabled to diagnose their learning status and knowledge level, by using, for example, formative quiz options. Should the student make the appropriate selection, the Messenger bot guides the discussion to the next level. Should the student make incorrect selections,

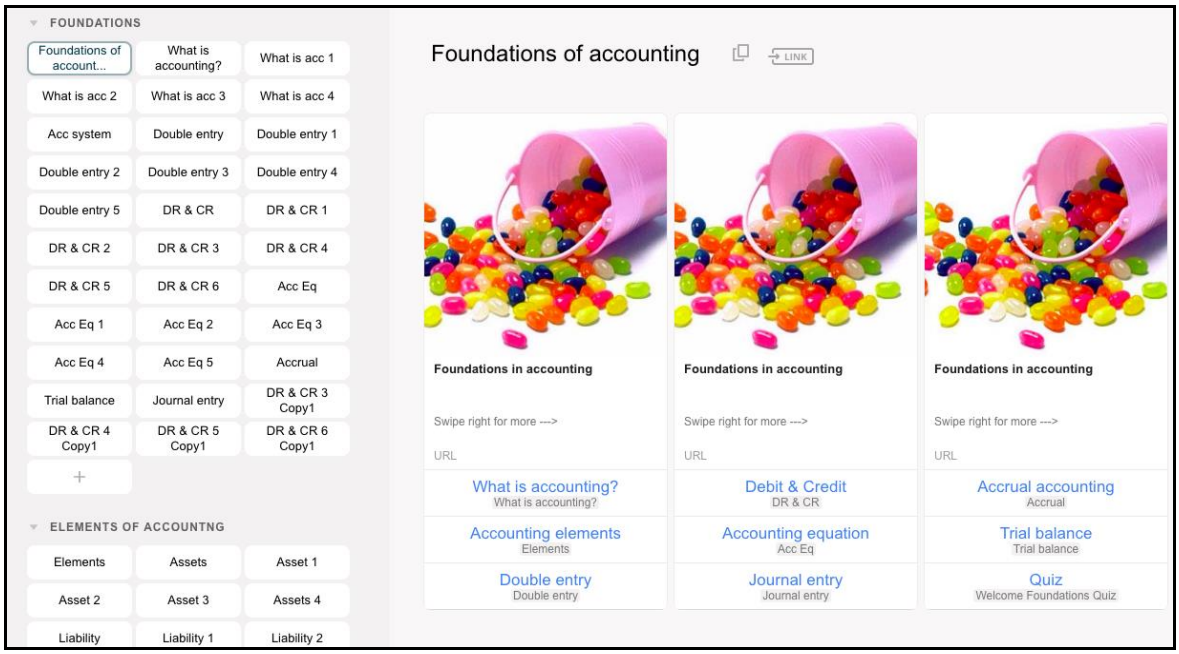
the Messenger bot provides remediation, to support the student create this knowledge before proceeding further (Figure 3.3 Panel C).

Figure 3-3: Content map

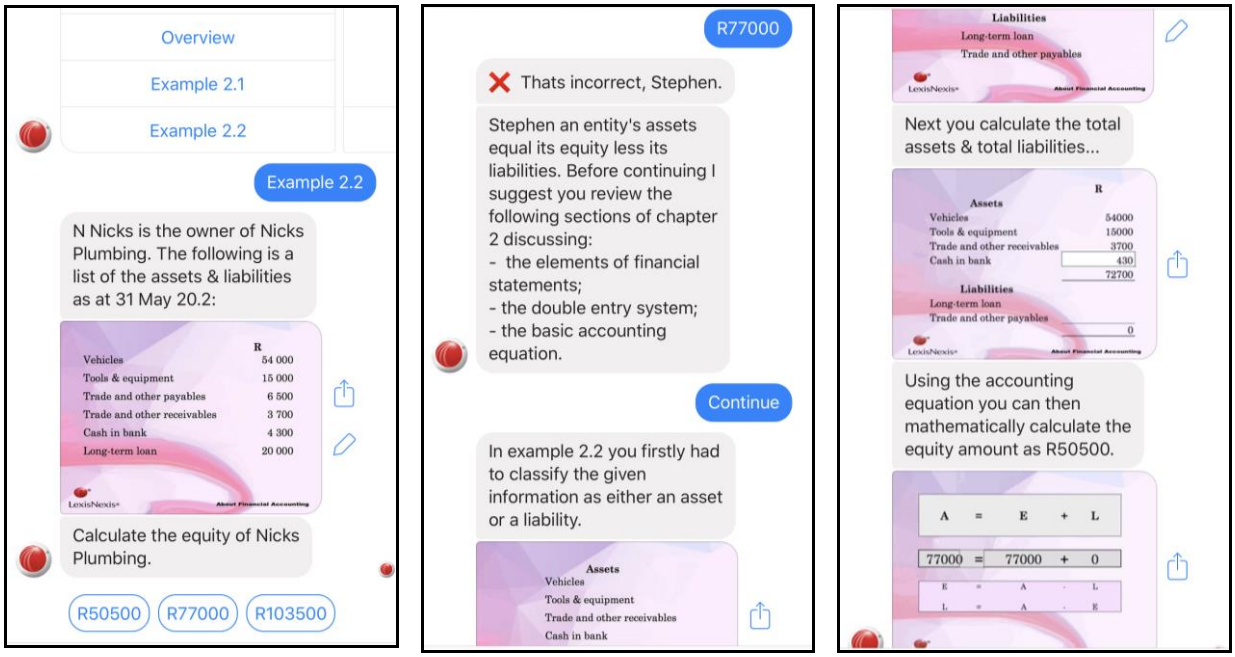
Panel A: Course administration



Panel B: Technical content overview

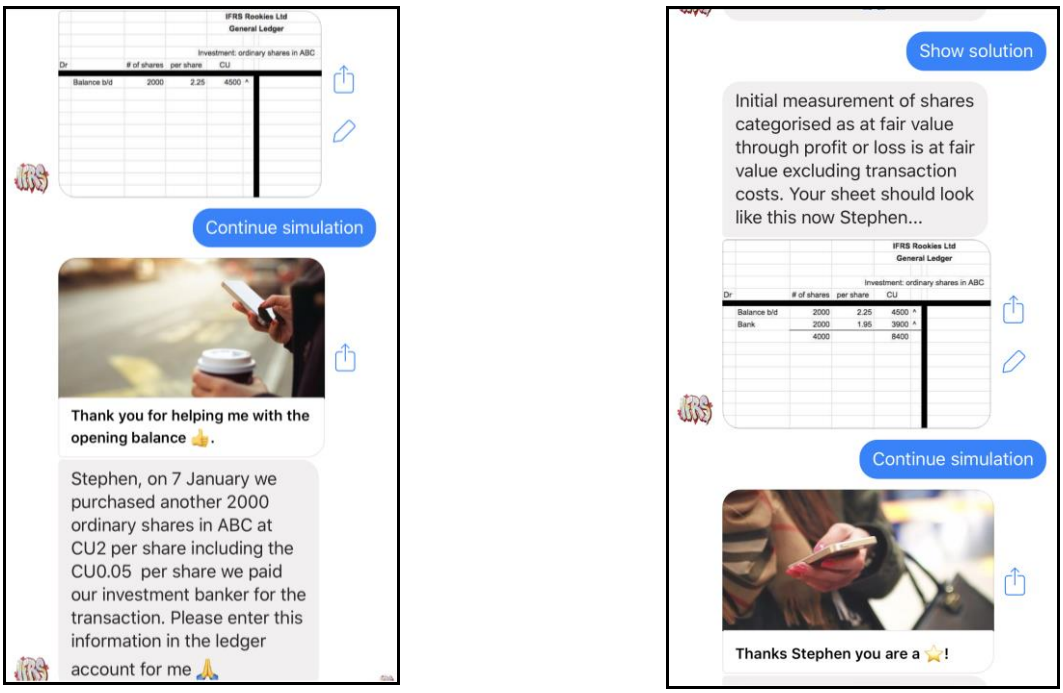


Panel C: Technical content scaffolding



The text messages communicating content, were carefully scripted to encourage anthropomorphism. Where possible, messages were personalized to create a rapport between the Messenger bot and the student (Figure 3.4). An effort was made to use friendly, inclusive language to simulate a conversation with a tutor or someone familiar. Messages were kept short as far as the content allowed and included emoji's to add color and personality (Figure 3.4). Short, bite-sized, resources are most effective for supporting learning through MIM apps (Bradley *et al.*, 2009).

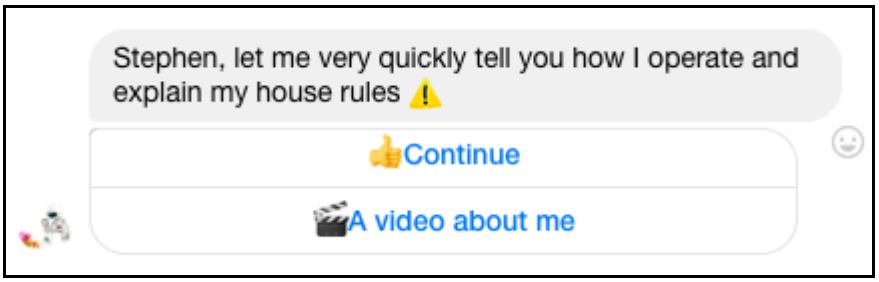
Figure 3-4: Personalized messages



3.3.3 Post implementation review

In reviewing the initial deployment, it was noted that many students were unfamiliar with Messenger bots and were not sure how to interact with them. In response, basic text instructions were included (Figure 3.5), including links to explanatory videos (https://youtu.be/X_x0XIksfm8 (Accounting Rookies) and https://youtu.be/eaj5cHNMWF0 (IFRS Rookies)).

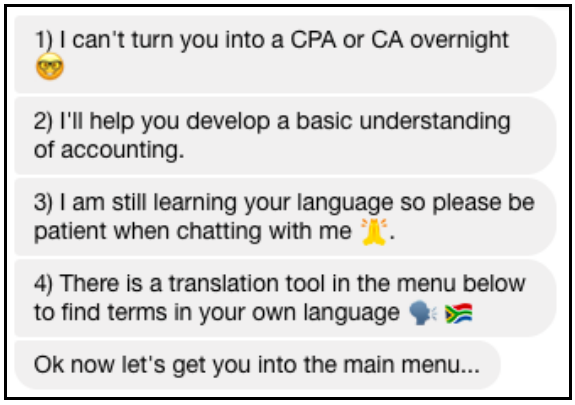
Figure 3-5: Basic instructions



Although attempting to embrace the potential learning benefits from anthropomorphism, given the current limitation of ANI, it was deemed necessary to manage the students' expectations of the capabilities of the Messenger bots (Figure 3.6). It was clearly

communicated to the students that they are interacting with a Messenger bot, to avoid inadvertently frustrating students. Siri, Alexa, and other virtual assistants may be making students more comfortable with interacting with bots, helping them understand the capabilities of bots. Students appear to naturally adjust their expectations when knowingly engaging with a bot, instead of a human, creating a smoother experience (Astute Solutions, 2017).

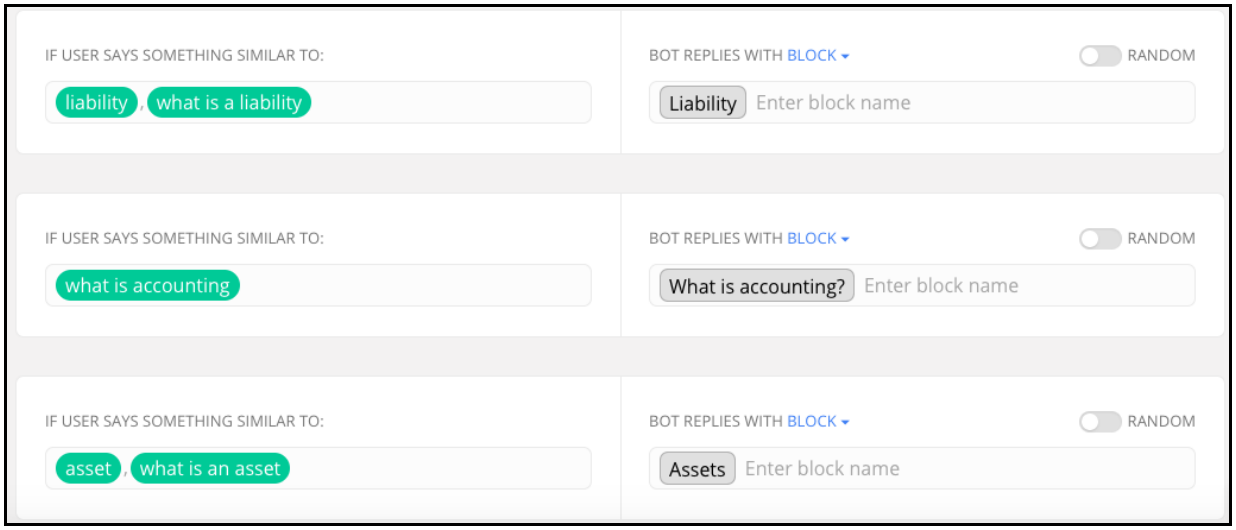
Figure 3-6: Managing students' expectations



Despite creating awareness of the Messenger bots' limitations, it was observed that students continued conversing with the bots. The Messenger bots were therefore enabled to respond to common words and phrases. The Chatfuel prepopulated knowledge database, supplemented by the Dialogflow[9] ANI engine, was adopted to achieve this. A common approach is to populate the Messenger bot's knowledge database with questions, phrases or words, and how the bot is to respond to each question, phrase or word (Kerly, Hall & Bull, 2007). Alternatively, an empty database can be used, to which content is added automatically as the bot is used (Abushawar & Atwell, 2007). The Chatfuel database follows the former approach. Questions, phrases, words and anticipated technical terms, with appropriate responses, for the content area, were manually added to the existing Chatfuel database (Figure 3.7).

[9] Dialogflow is a Google platform for building conversational experiences for bots and other conversational applications.

Figure 3-7: Chatfuel knowledge database



To respond to common 'small talk' words and phrases, Dialogflow's 'Small Talk' agent was adopted. This agent is prepopulated with specific 'small talk' words or phrases. Should the Chatfuel database not be able to respond, the Dialogflow engine is triggered (Figure 3.8).

Figure 3-8: Dialogflow

```
User: How are you?
Agent: Wonderful as always. Thanks for asking.

User: You're so sweet.
Agent: Thanks! The feeling is mutual.
```

Chat-logs created, during interactions with the students, served as sources for bot response improvement. Samples of interactions between the bots and the students were regularly reviewed and the Chatfuel knowledge database updated accordingly.

While it has been deemed sufficient to manage students' engagement with the Messenger bots through the design of the dialogue and the use of the Chatfuel and Dialogflow Engines, some instructors may prefer retaining control over any 'loose ends'. A live chat function can be included in the Messenger bots, allowing students to converse directly with the instructor where the bot is unable to respond. This may, however, be impracticable in a large class.

3.4 TEACHING AND LEARNING WITH ACCOUNTING ROOKIES AND IFRS ROOKIES

Students gain access to the bots in Messenger[10], by searching for the Messenger bot by name[11], or by following the direct link to the Messenger bot provided by the instructors, fellow students or friends. The Accounting Rookies and IFRS Rookies Messenger bots have been used in various pedagogical scenarios, commonly faced by instructors.

3.4.1 The flipped classroom

'Flipping the classroom' implies that students gain their first exposure to content outside of class, by reading prescribed material or watching lecture videos, freeing up class time to facilitate assimilation of knowledge, through for example problem-solving, discussion and debates (Bergmann & Sams, 2012; Sahin & Kurban, 2016).

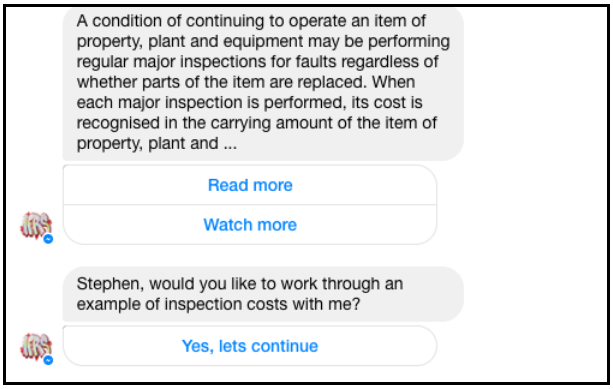
This means that students are learning (gaining knowledge and comprehension), at the lower levels of Bloom's revised taxonomy (1956), outside of class, while focusing on the higher levels of learning (application, analysis, synthesis, and/or evaluation) in class, where they can be supported by instructors and peers. The flipped classroom contrasts the traditional model of teaching, where the focus in class is on lower levels of learning with students assimilating knowledge, through homework, outside of class.

The Messenger bots have been designed to transform the students' work outside of class in a social constructivist manner. An instructor may enable collaborative learning through the Messenger bot's dialogue, scripted to encourage students to watch specific videos or read specific material, before asking questions in a quiz style format. By doing this, the Messenger bot supports the student's knowledge construction and comprehension (Figure 3.9).

[10] To access the Messenger bots, students must download and open the Messenger app for Android or IOS (alternatively via www.messenger.com on a computer). Initially, the students may be prompted to login to Messenger with their Facebook account or to create a new account.

[11] Once the Messenger bot is located, the students tap on it to open the chat window for that Messenger bot. Then the students tap on 'Get Started'.

Figure 3-9: Using a bot in a Flipped Classroom

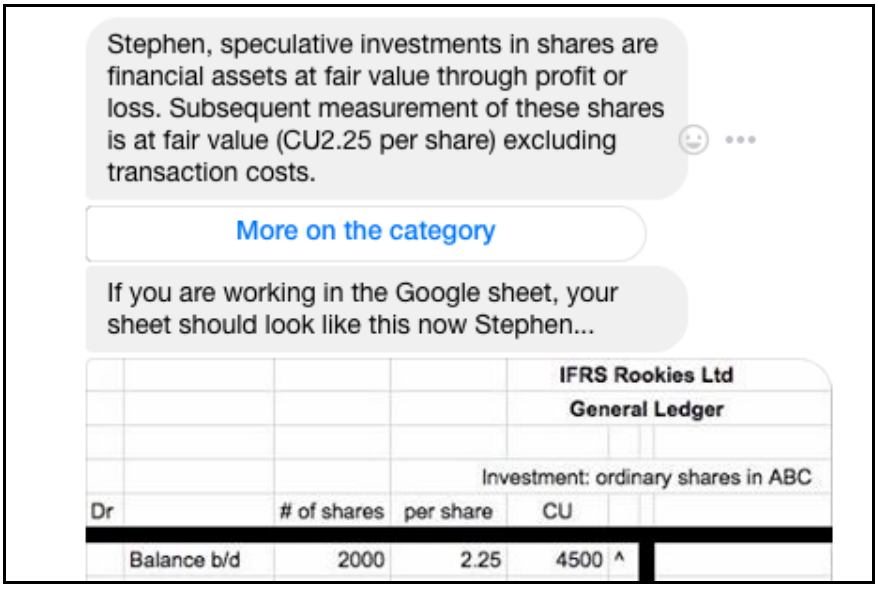


3.4.2 'Co-teacher'

To overcome some challenges of teaching large groups (such as students not receiving personal attention), instructors may 'team teach' with the Messenger bot. At its most basic level, team teaching takes the form of One Teach / One Guide (or Support) (Baeten & Simons, 2014). One instructor leads in facilitating learning, while the other supports and guides students that may need additional assistance. One Teach / One Support can be adopted for teaching new content or when one instructor has greater subject knowledge (Baeten & Simons, 2014).

The Messenger bots fulfilled the role of co-teacher in the support role. Students are able to personalize their learning and engage with the Messenger bot, finding answers to commonly asked questions, without disrupting the flow of the class. This enables students to work through material at their own pace, allowing differentiation in instruction. At key points, instructors can interject to add additional explanation or information. IFRS Rookies in particular includes elements designed to lead the students through examples during class (Figure 3.10) (https://m.me/ifrsrookies?ref=Shares%20case%201).

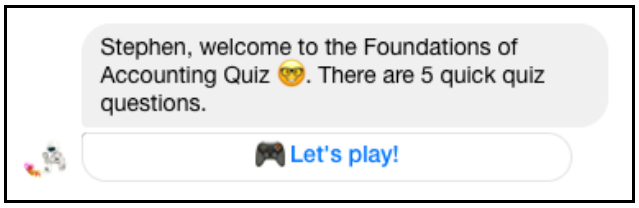
Figure 3-10: Examples during class

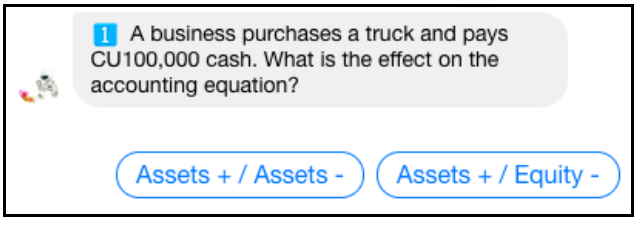


3.4.3 Keeping students engaged

In addition to enhancing the students' engagement before and during class, the Messenger bots encourage students to reflect on their learning after class, reinforcing what was taught and ensuring that the material has crossed the students' minds again, strengthening the learning pathways. The Messenger bots achieve this by sending a message to the students in Messenger, containing, for example, a text message with a link to a revision quiz (Figure 3.11).

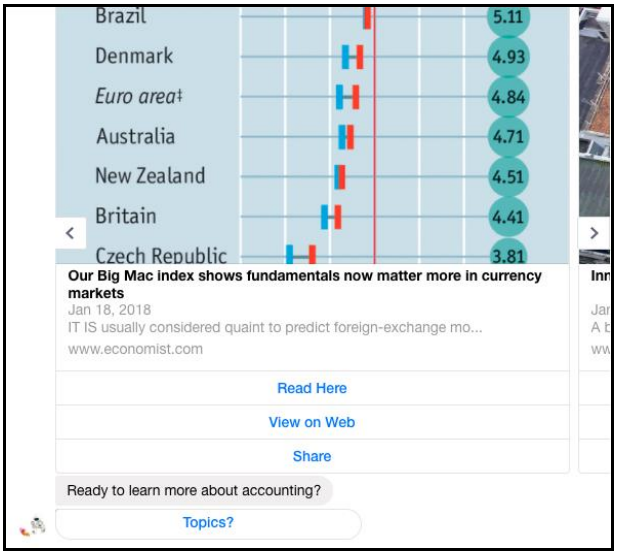
Figure 3-11: Revision Quiz





Additionally, students can subscribe to a financial news service within the Messenger bots to receive the latest financial news headlines on a daily basis (Figure 3.12).

Figure 3-12: Latest financial news



3.5 STUDENTS' EXPERIENCE OF USING MESSENGER BOTS IN TEACHING AND LEARNING

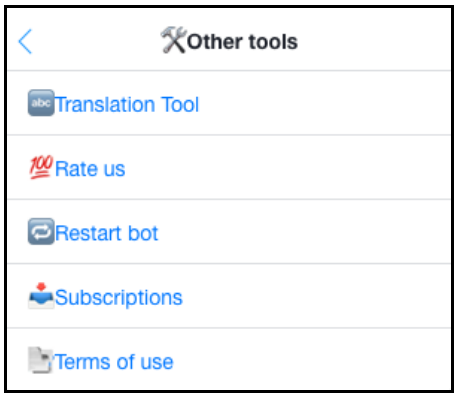
While Messenger bots potentially facilitate new approaches to teaching and learning, it is not guaranteed that significantly better learning effectiveness than conventional approaches, or appropriate learning outcomes, will be achieved. Understanding students' perceptions regarding the Messenger bots' effectiveness in their learning activities, is influential and critical to the success or failure of integrating Messenger bots into teaching and learning.

3.5.1 Method

As a preliminary evaluation, exploring the users' experiences of the Accounting Rookies and IFRS Rookies Messenger bots, user analytics were collected from Chatfuel and the results of the Messenger bots' 'Rate us' block. Chatfuel analytics are based on user data returned by the Facebook Graph API and is, therefore, restricted by Facebook's and the individual user's privacy settings. For example, Facebook allows Chatfuel access to users' time zones to allow, for example, the scheduling of messages. Access to a user's specific country information is, however, restricted by a user's privacy settings. As Messenger bot users are not Facebook 'Friends' with the Messenger bots, specific country information is not available. Information not made available by the Facebook Graph API, as well as user

feedback, must be collected directly from the users. Consequently, the 'Rate us' block was included in the bot design from initial launch of each bot. User feedback is voluntary and freely available at all times in each bot's persistent menu (Figure 3.13). The collection of data for this study, from the Chatfuel analytics and the bots' 'Rate us' block, was approved by the Institutional Review Board of the university. All respondents to the 'Rate us' block whose data is included in the data set underlying this study, were informed of and consented to the anonymous use of their responses for purposes of this study.

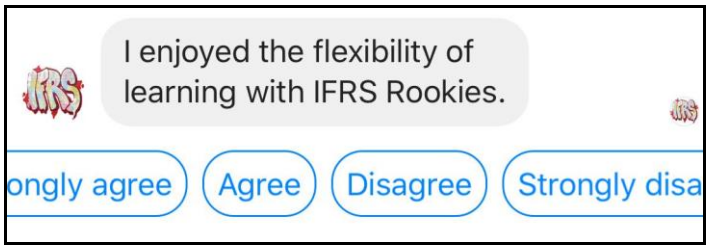
Figure 3-13: Persistent menu



The first question in the 'Rate us' block is, "Hello {{first name}}, thank you for supporting Accounting (or IFRS) Rookies. What has your experience of Accounting (or IFRS) Rookies been? Have we won your heart ❤? Or maybe just earned a balloon 🎈? Or are you feeling a little cold and disappointed ❄? Please tap the button below to tell us how you feel …"

The remaining questions were based on an existing instrument (Rambe & Bere, 2013) investigating physical, technical and functional affordances of WhatsApp in relation to their pedagogical value. This instrument was chosen, as Whatsapp is a MIM app offering similar functionality to Messenger, although to date does not allow bot integration. Users were required to indicate their agreement with each statement on a 4-point Likert scale, ranging from strongly agree to strongly disagree. A neutral point on the scale was not offered, to ensure that the respondents took a stance on each question (positive, or negative). Also, the 4-point Likert scale fits on a mobile screen in portrait mode, without the need for excessive scrolling (Figure 3.14). One question from the instrument was deleted, to improve internal reliability. Cronbach's alpha (α=0.72) exceeded the required threshold of 0.7, implying a high internal consistency of the scale (Field, 2013).

Figure 3-14: Likert scale



Data collected were analysed using SPSS Statistics 21. Descriptive statistics were used to examine respondents' demographic data and satisfaction levels. Differences in the respondents' satisfaction levels, between Accounting Rookies and IFRS Rookies, were explored using Analysis of Variance (ANOVA). Given the limited statistically significant differences identified in the respondents' satisfaction levels between the two Messenger bots, the discussion reports on the respondents' experiences of the Messenger bots collectively.

3.5.2 Results and Discussion

Demographic profile of users

The Accounting Rookies and IFRS Rookies Messenger bots are freely available in Messenger and not restricted to users from any particular course or institution. The Messenger bots were promoted amongst introductory and intermediate accounting students of the specific higher education institution. The South African Institute of Chartered Accountants (SAICA), advised faculty at Departments of Accounting at other South African universities of the availability of the bots. The Messenger bots also include a 'Share' option, allowing users to share the Messenger bots with Facebook and Messenger contacts. Finally, the Messenger bots are also listed in the 'Discover' section (equivalent of an app store) in the Messenger app. At 31 January 2018, Accounting Rookies, targeted at the introductory level, had accumulated significantly more reachable users (n=4 627) than the more specialist IFRS Rookies (n=1 757). Both Messenger bots had more female than male users, with the majority of users being in the GMT+2 time zone (South Africa), where the Messenger bots were developed and promoted (Table 3.1).

Table 3-1: Demographic profile of users

	Accounting Rookies		IFRS Rookies		Total	
	n	**%**	**n**	**%**	**n**	**%**
Gender						
Male	2 053	44	753	43	2 806	44
Female	2 574	56	1 004	57	3 578	56
Total	4 627	100	1 757	100	6 384	100
Time Zone						
GMT +2 (South Africa)	3 292	71	1 561	89	4 853	76
GMT (United Kingdom)	589	13	162	9	751	12
GMT -5 (Eastern Standard Time)	233	5	-		233	4
GMT -6 (Central Standard Time)	175	4	-		175	3
GMT -4 (Puerto Rico and US Virgin Islands Time)	96	2	-		96	1
GMT -8 (Pacific Standard Time)	95	2	-		95	1
Other	147	3	34	2	181	3
Total	4 627	100	1 757	100	6 384	100

Feedback rate and respondent profiles

For the period since the Messenger bots' launch in early 2017 to 31 January 2018, 608 evaluations of the users' overall satisfaction with the Messenger bots were received (Table 3.2). This represents a sampling rate of 10% (6% for Accounting Rookies and 18% for IFRS Rookies) with a 95% confidence level and a 4% margin of error. The sample decreases to 251 (4%) evaluations (n=104 (2%) for Accounting Rookies and n=147 (8%) for IFRS Rookies) when exploring the users' experience in greater detail (Table 3.3). This smaller sample offers a 95% confidence level and a 6% margin of error. These feedback rates approximate typical customer survey response rates, which are often below 2%

(Customer Thermometer, 2018). The gender profile of the respondents, for the overall satisfaction (Table 3.2) and the more detailed feedback (Table 3.3), is similar to the total population. The majority of the respondents for the overall satisfaction are again from the GMT+2 zone (Table 3.2). In respect of the respondents who provided more detailed feedback, it was established, through information provided by the users, that the majority of the respondents are South African university students (Table 3.3).

Table 3-2: Demographic profile of respondent users for overall satisfaction

	Accounting Rookies		**IFRS Rookies**		**Total**	
	n	**%**	**n**	**%**	**n**	**%**
Gender						
Male	117	40	119	38	236	39
Female	171	59	195	62	366	60
Unknown	4	1	2	0	6	1
Total	292	100	316	100	608	100
Time Zone						
GMT +2 (South Africa)	256	88	296	94	552	91
Other	19	7	13	4	32	5
Unknown	17	6	7	2	24	4
Total	292	100	316	100	608	100

Table 3-3: Demographic profile of respondent users for detailed responses

	Accounting Rookies		**IFRS Rookies**		**Total**	
	n	**%**	**n**	**%**	**n**	**%**
Gender						
Male	38	37	67	46	105	42
Female	62	60	80	54	142	57
Unknown	4	3	-	0	4	1
Total	104	100	147	100	251	100

	Accounting Rookies		IFRS Rookies		Total	
	n	**%**	**n**	**%**	**n**	**%**
Time Zone	**n**	**%**	**n**	**%**	**n**	**%**
GMT +2 (South Africa)	64	62	129	88	193	77
Other	28	27	8	5	36	14
Unknown	12	12	10	7	22	9
Total	104	100	147	100	251	100

Overall satisfaction

The majority of the respondents expressed overall satisfaction with the Messenger bots (Table 3.4). Of the respondents, 93% suggested the Messenger bots had 'won their hearts' (72%) or 'earned a balloon' (21%). Only 7% of respondents were left 'cold and disappointed'. Comments received from respondents included: "*This platform is superb*", "*I would like to thank you for giving me more knowledge on accounting*" and "*I love the chat bot!*". Some differences in the respondents' satisfaction with the Messenger bots were observed. A chi-square test of independence was performed to examine the relationship between the satisfaction of the respondents using the Accounting Rookies and the IFRS Rookies Messenger bot respectively. The relationship between these variables was significant, X2 (2, n=608) =5.74, p=0.057. More of the Accounting Rookies users (10%) suggested that the Messenger bot left them 'a little cold and disappointed' as opposed to IFRS Rookies respondents (5%). Female respondents were slightly more positive, with 74% suggesting the Messenger bots had 'won their hearts' as opposed to 69% of male respondents. A chi-square test of independence was performed to examine the relationship between the male and female respondents' satisfaction with the Messenger bots. The relationship between these variables was insignificant, X2 (2, n=602) =3.15, p=0.207.

Table 3-4: Overall satisfaction
Panel A: Total per Messenger bot

	Accounting Rookies		IFRS Rookies		Total	
	n	%	n	%	n	%
Won your heart ❤	210	72	227	72	437	72
Earned a balloon 🎈	53	18	72	23	125	21
A little cold and disappointed ❄	29	10	17	5	46	7
Total	292	100	316	100	608	100

Panel B: Total per Gender

	Male		Female		Total	
	n	%	n	%	n	%
Won your heart ❤	163	69	269	74	432	72
Earned a balloon 🎈	57	24	67	18	124	21
A little cold and disappointed ❄	16	7	30	8	46	7
Total	236	100	366	100	602	100
Unknown Gender					6	
Total respondents					608	

Detailed feedback: Teaching and Learning with Messenger bots

As an emerging technology, a significant number of students strongly agreed (n=122, 49%) or agreed (n=125, 50%) that Messenger bots provided an opportunity to experiment with new ways of learning online (M=3.46, SD=0.54) (Table 3.5). Many students also strongly agreed (n=114, 45%) or agreed (n=127, 50%) that learning with the Messenger bots afforded them flexibility (M=3.40, SD=0.60). This may be indicative of Messenger bots being situated in MIM apps on mobile phones and, therefore, being accessible 24 hours a day, seven days a week.

It was anticipated that Messenger bots may enable social constructivist teaching and learning, where students independently create and construct their knowledge through social interaction with the Messenger bots (Bii, 2013). The students strongly agreed and agreed that the Messenger bots helped their knowledge creation (n=85, 34%; and n=151,

60%) (M=3.27, SD=0.57), encouraged them to construct knowledge instead of passively acquiring it from instructors (n=74, 29%; and n=128, 51%) (M=3.08, SD=0.72) and facilitated collaborative learning with the Messenger bot (n=56, 22%; and n=164, 65%) (M=3.06, SD=0.67).

The students strongly agreed (n=73, 29%) or agreed (n=132, 52%) that the Messenger bots allowed more time to reflect deeply while learning (M=3.10, SD=0.70). The conversation with the Messenger bots flows at a pace controlled by the student. The Messenger bot pauses should there be no response from the student, thus allowing the student to pace their own learning, and to continuously reflect and consolidate their knowledge while learning. A respondent commented that "*This Messenger bot was a great idea. You get to see where your problem areas lie*". The ability to control the conversation's pace may also be evident in the students strongly disagreeing (n=46, 18%) or disagreeing (n=150, 60%) that "receiving messages from the Messenger bot frustrates me because I am not given time to rest" (M=2.12, SD=0.79).

While many students strongly agreed and agreed that engagement levels were higher with the Messenger bots than in a face-to-face classroom (n=54, 21%; n=79, 31%), many students disagreed (n=97, 39%) (M=2.65, SD=0.91). It may be that quieter, shyer, less assertive students may benefit more from increased engagement levels with the Messenger bot than their peers who more actively engage in a face-to-face classroom (Riel, 2016). However, given that several students disagreed, this suggests that Messenger bots' potential lies in supplementing, rather than replacing, the traditional classroom. This suggestion was supported by many students strongly agreeing (n=112, 44%) or agreeing (n=54, 22%) that Messenger bots could supplement face-to-face classroom learning (M=2.75, SD=0.93). These results provide initial evidence supporting the use of Messenger bots, particularly given their ability to communicate in a more natural and conversive manner, as a support 'teacher' with the instructor taking the lead. A respondent student commented that, "*Accounting Rookies is like having a 24/7 tutor. One who answers quick and in an understandable manner*". Additionally, the motivational aspect (Pokatilo, 2016) of the conversation between the Messenger bot and a student is acknowledged, *"Thanks for encouraging me to do better".* The instructors, therefore,

appear to be appropriately scripting the Messenger bots' dialogue to take advantage of anthropomorphism (Pokatilo, 2016) by mimicking the dialogue of a co-teacher or tutor.

The majority of students strongly agreed (n=68, 27%) or agreed (n=161, 64%) that learning with the Messenger bots was effective (M=3.17, SD=0.61) and strongly agreed (n=105, 42%) or agreed (n=110, 44%) that they would recommend Messenger bots for all courses (M=3.25, SD=0.75) "*This has been a wonderful experience and I wish there could be something like this on lessons such as Mathematics*" (Respondent student), and "*Create economics and business studies rookies*" (Respondent student). Analysis of the students' experience by gender (untabulated) revealed no statistical differences between the male and female respondent group other than the male students more strongly agreeing (M=3.40, SD=0.767) than the female students (M=3.15, SD=0.734) that they would recommend the use of Messenger bots for all their courses (F=6.857, p=0.009).

Finally, students strongly agreed (n=67, 27%) or agreed (n=119, 47%) that the Messenger bots were cost effective (M=2.92, SD=0.87). Messenger bots are freely available within Messenger and use the same amount of data as traditional interaction via MIM apps.

Table 3-5: Students' experiences of using Messenger bots in teaching and learning

	Accounting Rookies (n=104)		**IFRS Rookies (n=147)**		**Total (n=251)**	
	M	**SD**	**M**	**SD**	**M**	**SD**
The opportunity to experiment with new ways of learning online was possible with the Messenger bot.	3.45	0.54	3.48	0.54	3.46	0.54
I enjoyed the flexibility of learning with the Messenger bot.	3.36	0.64	3.43	0.57	3.40	0.60
The Messenger bot helped with my knowledge creation.	3.36**	0.57	3.22**	0.57	3.27	0.57
I would recommend Messenger bots for all my courses.	3.28	0.65	3.23	0.82	3.25	0.75
My participation in learning activities on the Messenger bot was effective.	3.15	0.65	3.17	0.58	3.17	0.61

	Accounting Rookies (n=104)		IFRS Rookies (n=147)		Total (n=251)	
	M	**SD**	**M**	**SD**	**M**	**SD**
The Messenger bot allowed me to have more time to reflect deeply as I was learning.	3.16	0.70	3.05	0.71	3.10	0.70
The Messenger bot encouraged me to construct knowledge instead of acquiring it passively from the instructor.	3.13*	0.76	3.05*	0.70	3.08	0.72
The Messenger bot facilitates collaborative learning with the Messenger bot.	2.95	0.69	3.14	0.64	3.06	0.67
The Messenger bot is cost effective.	2.82	0.92	3.01	0.83	2.92	0.87
The Messenger bot can supplement face-to-face classroom learning.	2.87	0.80	2.67	1.00	2.75	0.93
My engagement level is higher in the Messenger bot than in a face-to-face classroom environment.	2.81	0.88	2.54	0.92	2.65	0.91
Receiving messages from the Messenger bot frustrates me because I am not given time to rest.	2.15	0.80	2.09	0.78	2.12	0.79

M = Mean; SD = Standard deviation
Scale: 1=Strongly disagree; 2=Disagree; 3=Agree; 4=Strongly Agree
* mean scores differ significantly (F=5.108, p=0.025)
** mean scores differ significantly (F=3.430, p=0.065)

3.6 CONCLUSION

This study provides a thick description of the development of two Messenger bots, Accounting Rookies and IFRS Rookies, designed to act as virtual 'tutors' for introductory and intermediate accounting respectively. The Messenger bots were developed using Chatfuel, a visual development tool for developers that do not have any coding knowledge. Informed by social constructivist learning, the Messenger bots were designed, to fulfil the support role offered by a co-teacher in the context of a large class, to support learning in

the absence of a teacher or as part of a flipped classroom outside of class, and to increase student engagement in and outside of the classroom by pre-empting and responding to frequently asked questions on the course content. Through careful design of the discussion flow, scripted responses and prompts, the Messenger bots were designed to scaffold each individual student's learning and to encourage students to reflect on their learning through, *inter alia*, broadcasting messages to the students, containing, for example, a link to a revision quiz.

Although the number of respondents and limited contextual information available curbs the generalization of the results reported on the users' experience of learning with the Messenger bots, the initial results are encouraging. Often supplementary learning aids are ignored by students, however, the results suggest that students did engage with the Messenger bots. The majority of the respondents expressed their overall satisfaction with the Messenger bots, with 72% of the respondents suggesting that the bots had 'won their hearts'. The education benefits of using these bots, as perceived by the students, included experimenting with new ways of learning online, flexibility of learning with the bots, knowledge creation and construction being assisted, collaborative learning being facilitated, and the opportunity created for reflection. While many of the students strongly agreed or agreed that their engagement level is higher with the Messenger bot than in a face-to-face classroom environment, there were a number of students that disagreed, suggesting that the Messenger bots' potential may lie in supplementing, rather than replacing, the face-to-face classroom.

While several suggestions for the application of Messenger bots in teaching and learning are offered, and initial evidence supporting the use of Messenger bots in teaching and learning are provided, much speculation remains. To confirm or dismiss the effectiveness of each of the initial suggestions offered for the use of Messenger bots and the students' experiences thereof, further corroboration through exhaustive evaluation in various contexts is required. The methodology applied in the development of the different Messenger bots can be used by instructors in developing their own Messenger bots, without any coding knowledge. Instructors are, therefore, encouraged to develop Messenger bots for their disciplines, courses and students by following the replicable guidance provided in this paper.

Each suggested application of Messenger bots in teaching and learning represents an opportunity for in depth future research, to explore, *inter alia*, the students' lived experiences thereof, the instructors' experience of designing and using a Messenger bot, and the effect on student learning. Explorations of specific applications could include interaction patterns by the students, frequency of usage, types of interactions, and matching to sections of a course. Experimental research is encouraged to provide insights into whether, or not, Messenger bots offer significantly better learning effectiveness in specific applications than conventional approaches. Further, this study does not consider the use, and difference therein, of the Messenger bots as a mobile technology in formal and informal education settings. Future research in this regard is encouraged. Also, research is encouraged to explore whether Messenger bots, through embracing social constructivism, are able to more effectively achieve deeper learning than traditional mobile education apps that have been criticised for promoting rote learning. Additionally, the novelty of learning with Messenger bots, may have affected the users' experience thereof and consequently the results reported. Subsequent research of using Messenger bots in teaching and learning, following wider adoption and more sustained use thereof, may enhance the generalizability of the results reported in this study beyond the initial adoption of the Messenger bots.

In conclusion, the use of Messenger bots to support teaching and learning offers new possibilities, and has the potential to modify traditional teaching and learning, particularly as the technology matures and becomes more accessible to instructors. Finally, given that the development of Messenger bots can be undertaken without any coding knowledge, it is, submitted that instructors, rather than programmers, should take ownership of developing bots for teaching and learning. The ability to communicate content to encourage social constructivist learning is a skill that instructors specialise in.

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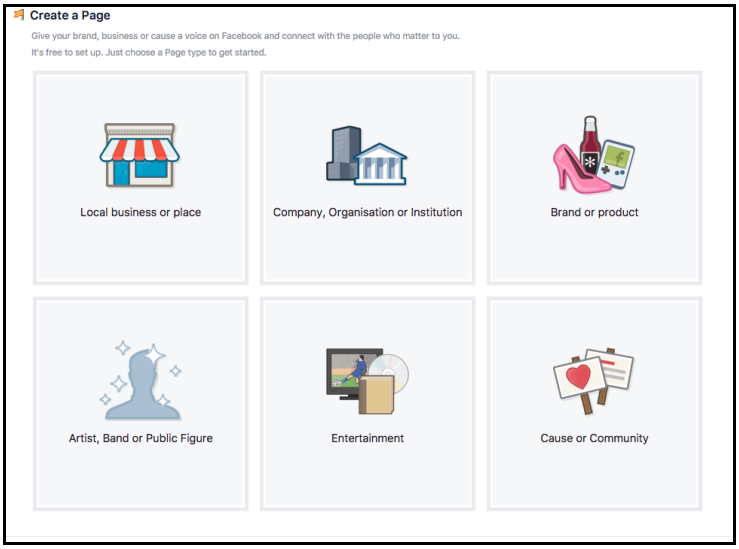
3.8 APPENDIX A: INSTRUCTIONS FOR THE INITIAL DEVELOPMENT OF A MESSENGER BOT

3.8.1 Create a Facebook Page

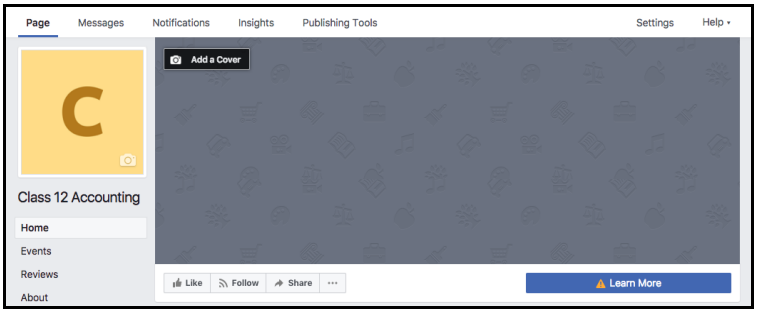
A Messenger bot has to be connected to a Facebook Page for it to be discoverable and usable in Messenger. A Facebook Page is a public profile specifically created for a business, brand, celebrity, cause, or other organization, such as a classroom. Pages are public for everyone to see, like, and comment on. A Facebook Page can be created at https://www.facebook.com/pages/create or by clicking in the bottom left corner of the Facebook Home page on ‘Create Page’. Click ‘Cause or Community' from the list of templates available (Figure 3.15).

Figure 3-15: Create a Facebook Page



Type in the name of the Page, for example: Class 12 Accounting. Click 'Get Started'. The next screen displays the new Facebook Page (Figure 3.16). Add a cover photo and profile photo. The profile photo will also be used as the Messenger bot’s profile photo.

Figure 3-16: New Facebook page

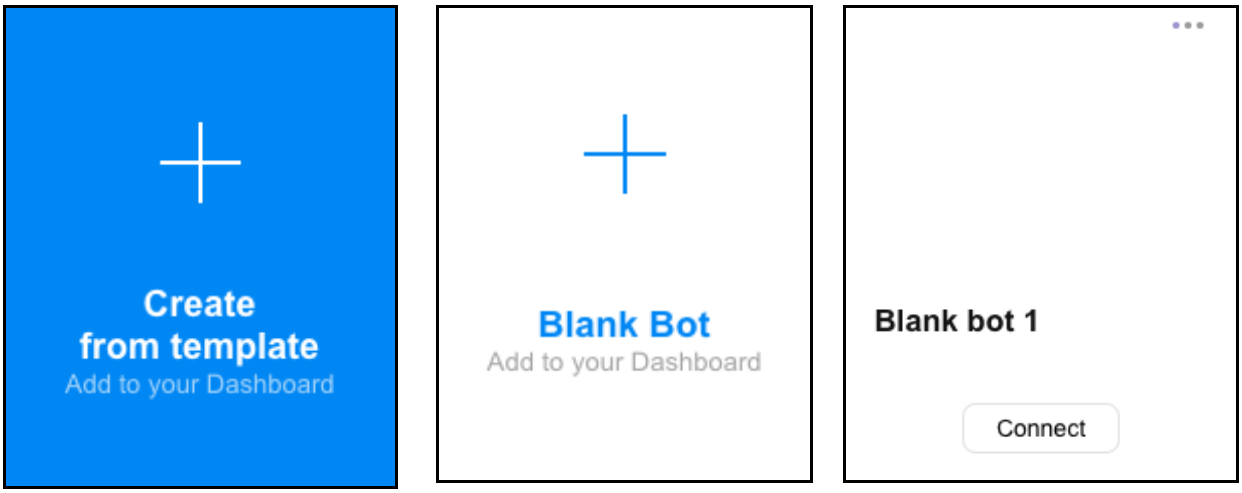


Click 'Learn More' under the cover photo (Figure 3.16), select 'Get in Touch' and then 'Send Message' and finally confirm 'Add Button'. You do not need to turn on instant replies. The ‘Send Message’ button will allow students to connect with the Messenger bot through the Facebook Page as an alternative to directly connecting with the bot in Messenger.

3.8.2 Create a Messenger bot

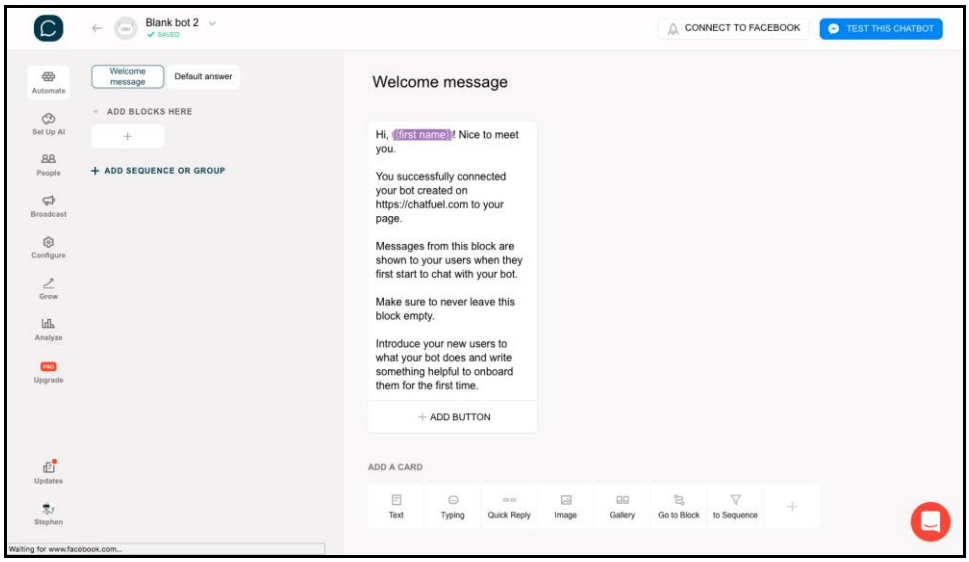
Go to www.chatfuel.com and login with the Facebook account connected to the Facebook Page. After logging in via Facebook you can create a new blank Messenger bot by clicking on ‘Create from template’, then ‘Blank Bot’. The new bot will then appear on your home screen ‘Blank bot 1’ (Figure 3.17):

Figure 3-17: Blank Messenger bot



Tap on the three dots in the top right corner to name your bot. Clicking on ‘Blank bot 1’ (or as renamed) opens the development page (Figure 3.18).

Figure 3-18: Development page



3.8.3 Connecting the Messenger bot to the Facebook Page

To connect the Messenger bot to the Facebook Page, in Chatfuel, on the development page, click on:

CONNECT TO FACEBOOK

A list of Facebook Pages connected to the Facebook account used to login to Chatfuel is presented, locate the appropriate Facebook Page and click on:

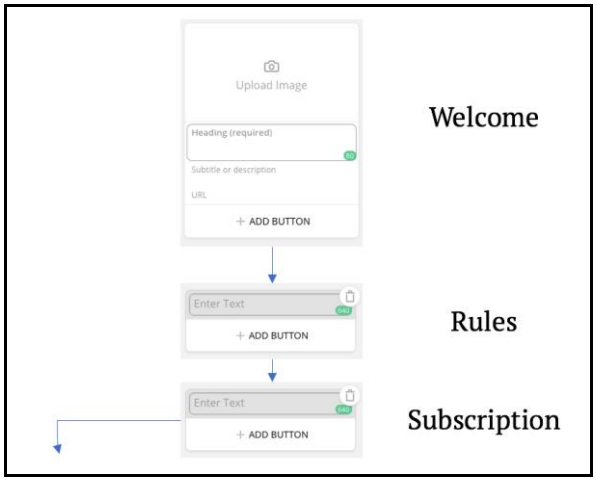
CONNECT TO PAGE

The Messenger bot is now published to Messenger and is discoverable by the students through searching for the bot in Messenger or in Facebook.

3.8.4 Adding content to the Messenger bot

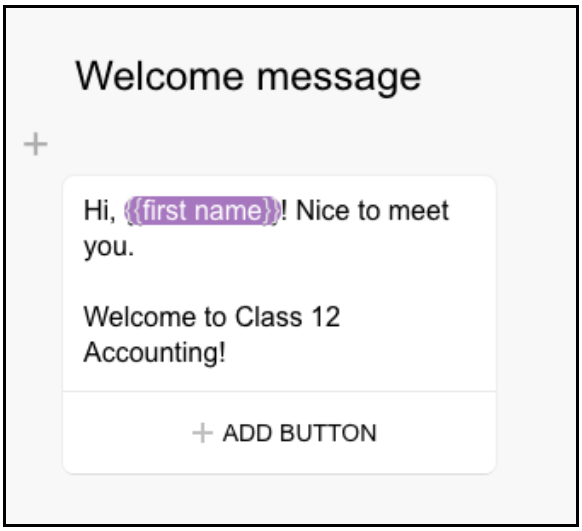
To illustrate adding content to the Messenger bot, the development of the welcoming block(s) is briefly discussed. The welcome section could be developed as 3 interlinked blocks for ‘Welcome’, ‘Rules’ and ‘Subscription’ (Figure 3.19).

Figure 3-19: Welcoming block



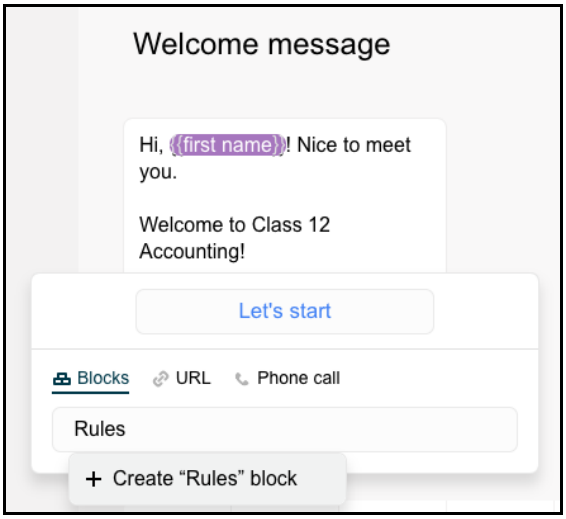
For the initial welcome block, edit the existing text card in the 'Welcome message' block (Figure 3.20). Any message can be personalized by typing {{first name}}. This instructs the Messenger bot to fetch the student's first name from their Facebook or Messenger profile and to insert the name in the message sent to the student.

Figure 3-20: Welcome message



Use the buttons on the card to link this block through to the next block, which may contain the Messenger bot's rules (Figure 3.21).

Figure 3-21: Linking the welcome message

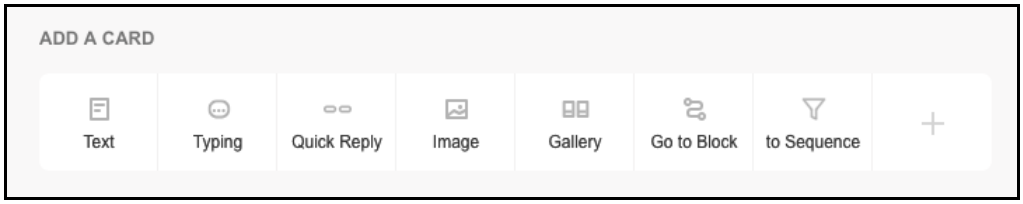


Type the message to be displayed on the text button (for example 'Let's start'). Select the option that specifies that the button will link to another 'Block' (other options being an internet url or phone number). Type the name for the block being linked to, in the entry field and click on '+ Create "blocks name" block'. The block created will appear on the development page (Figure 3.22).

Figure 3-22: Block on development page

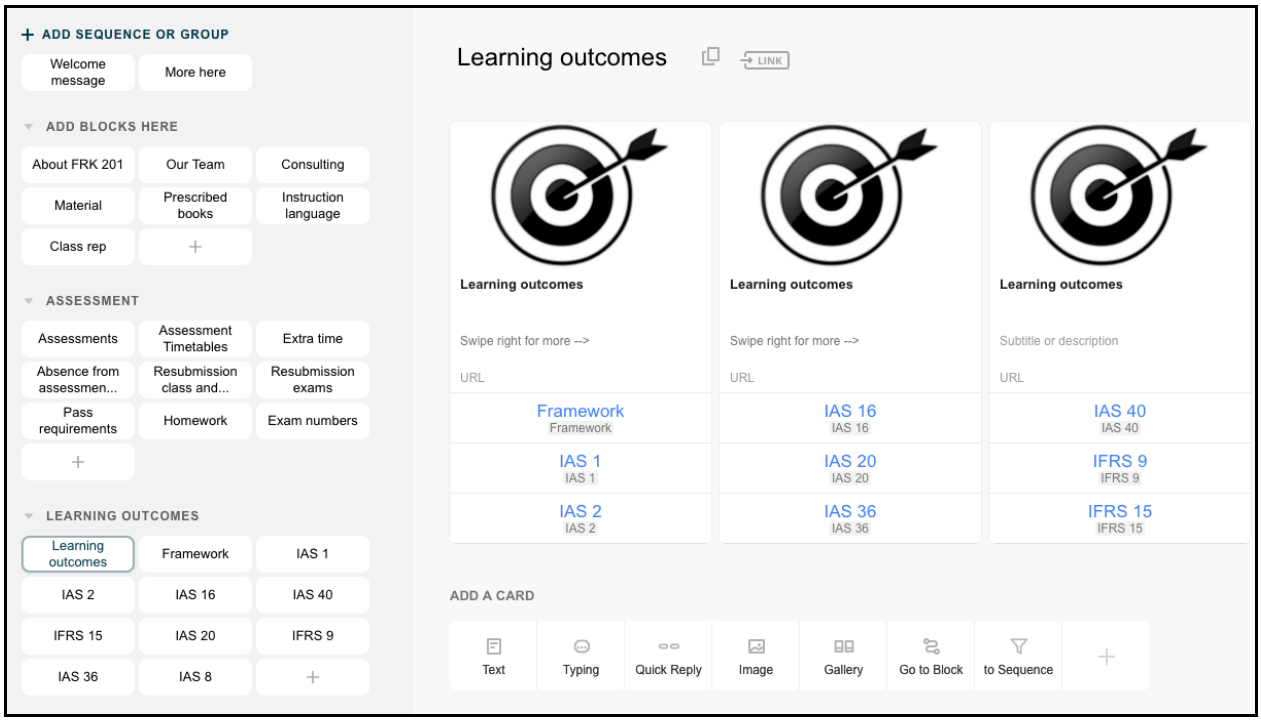
Click on the new block and add text or other cards by using the toolbar (Figure 3.23).

Figure 3-23: Toolbar



The following is an illustration of the development page of an existing course administration Messenger bot (Figure 3.24), utilising gallery cards in a ‘Learning outcomes’ menu block linked to blocks containing the learning outcomes of each topic:

Figure 3-24: Development page of an existing Messenger bot



4 CHAPTER 4: STUDENTS' EXPERIENCE OF TEAM ASSESSMENT WITH IMMEDIATE FEEDBACK IN A LARGE ACCOUNTING CLASS

4.1 INTRODUCTION

This study reports on the use of a Team Assessment with Immediate Feedback (TAIF) as a competency-based collaborative learning technique in which immediate formative feedback is provided to students by their peers and the assessment instrument. In particular, this study documents the design of a TAIF and the students' experiences thereof in a culturally diverse undergraduate professional accounting education course. Team assessment, also referred to as cooperative assessment (Zimbardo, Butler & Wolfe, 2003) or collaborative assessment (Kapitanoff, 2009), involves assessment of students in small groups (Stark, 2006) working towards a common goal (Wilson, Ho & Brookes, 2017). Team assessment has been associated with professional higher education[12] contexts (Bay & Pacharn, 2017), given the potential thereof to meet the needs of students, employers and society through developing collaboration, reflection, and lifelong-learning skills (Harris *et al*., 2017). Professional higher education refers to institutions and programs that are profession-oriented and offer vocational training, incorporating 'practical skills development or training', for prospective 'professionals' (Delspace, 2018) such as accountants, engineers, physicians, dentists, veterinary surgeons and architects.

Professional accounting education and training is historically characterised by a dual qualification system with a higher education degree, followed by a period of training in professional practice (Eraut, 1994). A critical disadvantage of this system is the separation of 'theory' from 'practice' (Wilson, 2011), where professional education has emphasised propositional knowledge, while largely ignoring process knowledge and the development of generic skills (McLoughlin & Luca, 2002). The increasing use of information technology, internationalization, teamwork, and networking in the professional workplace has necessitated a realigning of higher education to include the development of generic skills (McLoughlin & Luca, 2002). Problem solving, teamwork, and communication skills are the

[12] Professional higher education refers to institutions and programs that are profession-oriented and offer vocational training, incorporating 'practical skills development or training', for prospective 'professionals' (Delspace, 2018) such as accountants, engineers, physicians, dentists, veterinary surgeons and architects.

most needed skills in the 21st century workplace (Tabary, 2015) and accounting employers have indicated that the development of these skills at higher education institutions is more important to them than the acquisition of technical accounting knowledge (Jackling & de Lange, 2009).

For instructors, the realignment of professional education towards an increased emphasis on the development of generic skills, requires a change towards a more competency-based approach (Biggs, 1999). Competency-based education, inter alia, requires a broadening of assessment from its traditional summative focus on assessment of knowledge to approaches that integrate the formative assessment for learning, to construct knowledge, and develop skills, behaviour and attitudes (Harris *et al*., 2017). Critical to the success of formative assessment for learning in competency-based education is the use of formative feedback (Harris *et al*., 2017). Formative feedback is behaviour- and/or task specific, based on direct observation, allowing students to gain a timely awareness of their strengths and weaknesses (Epstein *et al*., 2002) and facilitates learning in a student's zone of proximal development (Chen, Breslow & DeBoer, 2018). The positive effects of feedback on learning may, however, be negated by instructors and students excessively focusing on test scores rather than on feedback (Crooks, 1988). This may be particularly true in professional accounting education, given the ingrained fixation of instructors, the profession and students with pass rates in professional accountancy examinations (Coetzee & Schmulian, 2012; Wilson, 2011).

This ingrained fixation with pass rates results in ‘teaching to the test’, with worrying overtones of rote learning of content and disregard for process knowledge, problem solving and the development of other generic skills (Coetzee & Schmulian, 2012; Wilson, 2011). Team assessment may assist in the realignment of accounting education towards a greater focus on process knowledge and the development of generic skills. The facilitation of collaborative learning, which is suited to developing these skills, is challenging (Wilson, Ho & Brookes, 2017). Faculty may, therefore, require specific professional development in the facilitation of collaborative learning (Burbach, Matkin, Gambrell & Harding, 2010).

There is no research, into the use of a summative team assessment, integrating immediate formative feedback, in competency-based professional higher education. This

paper, therefore, provides a thick description of the development and facilitation of a TAIF, as a competency-based collaborative learning technique, to develop accounting students' generic skills, in a professional undergraduate accounting education course. This study further reports on the students' experiences of the TAIF. A mixed methods approach, incorporating both quantitative and qualitative analysis, was adopted to explore the students' lived experiences of the TAIF.

4.2 LITERATURE REVIEW

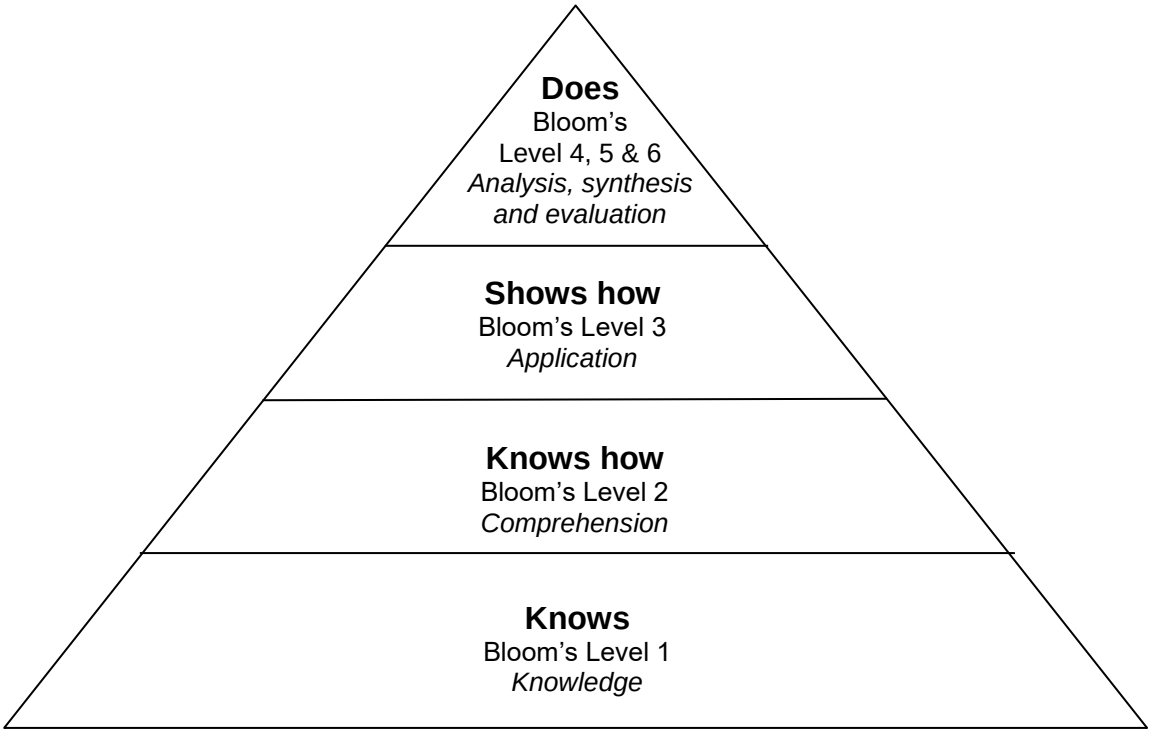
Historically, knowledge creation or learning was seen as a personal quality or attribute. Vygotsky, however, theorised that every conversation or encounter between two or more people presents an opportunity for new knowledge to be obtained (Vygotsky, 1978). Grounded in Vygotsky's theory of social constructivism, there has been increasing evidence that learning is a social-based process, where communication and negotiation skills come into play when a learner faces new challenges in authentic problem solving (McLoughlin & Luca, 2002). Constructing knowledge through conversation and collaboration, improves students' academic performance (Jang, Lasry, Miller & Mazur, 2017; Opdecam, Everaert, van Keer & Buysschaert, 2014), as students are able to obtain a greater understanding of concepts through collaborative learning with their peers (Damon & Phelps, 1989). Additionally, collaborative learning creates a more comprehensive competency-based learning environment than an individual learning environment, by broadening the generic skills that can be developed (Jang *et al.*, 2017; Wilson, Ho and Brookes, 2017).

4.2.1 Competency-based accounting education

Competency-based accounting education is an approach to teaching, learning and assessment that aims to improve the education and training of future accounting professionals so that they can deliver consistent and high quality accounting and related professional services (Boritz & Carnaghan, 2003; Lawson *et al.*, 2013). Competency-based learning in accounting education is influenced by numerous competency frameworks, proposing the knowledge and skills required for effective professional practice, adopted by various professional accounting associations (see Certified

Professional Accountants (CPA) Canada, 2018; Association of Chartered Certified Accountants (ACCA), 2018; South African Institute of Chartered Accountants (SAICA), 2018). Education premised on competency frameworks should engage students in authentic tasks that emphasise competency-based *assessment for learning* (Schuwirth & van der Vleuten, 2011) situated at the 'showing how' and 'doing' levels of Miller's Pyramid of Professional Competence (Miller, 1990) (Figure 4.1). Competency-based assessment, which might not reflect traditional examination methods, improves the quantity and quality of feedback to students, supports the practice of reflection and the development of lifelong learning skills (Harris *et al*., 2017).

Figure 4-1: Miller's Pyramid of Professional Competence



Source: Miller, 1990, adapted for equivalent Bloom's levels

The affordances of team assessments, are therefore framed by social constructivist competency-based learning.

4.2.2 Team assessment

Team assessment, or assessment of students collaborating in small groups working towards a common goal, has been suggested as an effective competency-based

collaborative learning technique (Jang *et al.*, 2017). Team assessment improves academic performance (Simpkin, 2005; Slusser & Erickson, 2006) and cognitive processing (Kapitanoff, 2009), increases retention of concepts (Kapitanoff, 2009; Zipp, 2007), increases motivation (Shindler, 2004; Zimbardo, Butler & Wolfe, 2003), decreases test anxiety (Lusk & Conklin, 2003; Zimbardo, Butler & Wolfe, 2003), creates positive rapport between classmates (Sandahl, 2010), develops communication and teamwork skills (Reinig, Whittenburg & Horowitz, 2009) and improves student evaluations of teaching (Hite, 1996).

Team assessment places the emphasis on authentic interactions and teamwork and students learning to collaborate. Despite the evidence of the effectiveness of team assessment in the broader literature (see Jang *et al.*, 2017), team assessment has not achieved the same effectiveness in accounting education as in other disciplines (Clinton & Kohlmeyer, 2005; Gabbin & Wood, 2008). Where the literature has provided some positive evidence in accounting education (see Bay & Pacharn, 2017; Reinig, Horowitz & Whittenburg, 2014), the generalizability of these results is uncertain as these studies reported on small classes of graduate accounting students (n=47; Bay & Pacharn (2017) and n=35; Reinig *et al.* (2014)). It is therefore "urgent for accounting educators to push forward in searching for cooperative learning techniques that produce positive results in accounting education" (Bay & Pacharn, 2017:317), particularly in competency-based, undergraduate, professional accounting education.

4.2.3 Intercultural team assessment

Much of the literature supporting team assessment considers the effectiveness thereof within the context of culturally homogenous class groups (Moore & Hampton, 2015). Team assessment involving culturally and linguistically diverse students is less explored, and remains more contentious (Moore & Hampton, 2015). Students appear to prefer collaborating in group or team activities with students of similar backgrounds for various cultural and pragmatic reasons (Volet & Ang, 1998). Collaborative activities, necessitating interaction amongst a diverse student group, may however improve students' cultural awareness and their positivity towards intercultural teamwork (Volet & Ang, 1998).

Intercultural teamwork is perhaps more necessary and prevalent in South Africa than in many other countries, given the county's diversity. Almost 25 years since the demise of Apartheid, South Africa continues to grapple with the integration of its culturally diverse population (Habib, 2016). Embracing students as active partners in the learning process and working towards a common goal, through team assessment, may have the potential to be a catalyst for a more democratic and inclusive approach to education and enhance the students' positivity towards, and effectiveness for, working in intercultural teams. This study, therefore, explores the students' experiences of team assessment in a multicultural environment.

4.2.4 Feedback

In a social constructivist, competency-based learning environment, students begin to form their understanding of a concept from their prior knowledge and experiences (Chen *et al.*, 2018). The gap between the students' current understanding and the desired learning goal is, inter alia, facilitated by formative feedback (Shute, 2008). Formative feedback is therefore an essential element of competency-based *assessments for learning* (Brown, 2005; Harris *et al*., 2017). Formative feedback can assist students in correcting behaviours that are ineffective and reinforce behaviours that are effective, in a safe environment (Bazrafkan, Ghassemi & Nabeiei, 2013). Formative feedback has the potential to support learning, particularly in courses with a hierarchical structure (Schneider, Hein & Murphy, 2014), like introductory or intermediate accounting, where topics build directly on earlier course topics.

Feedback is defined as "information given by an agent (e.g. teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding" (Hattie & Timperley, 2007:81) and comprises several dimensions: feedback on task execution; feedback on learning strategies; feedback on metacognitive skills; and feedback on the self as person (Chen *et al.*, 2018). Feedback on learning strategies and metacognitive skills impose the heaviest cognitive load but encourage deeper learning than the surface knowledge gained from feedback on task execution (Blazer, Doherty & O'Connor, 1989). The dimensions of feedback are, however, not mutually exclusive and it is possible, and perhaps preferable, to give feedback for task execution and deeper learning

simultaneously (Earley, Northcraft, Lee & Lituchy, 1990). Within a student's zone of proximal development feedback at the task execution level for a student, with the necessary metacognitive awareness, can help that student develop learning strategies on their own. This may be more powerful than direct feedback to the student on learning strategies (Chen *et al.*, 2018). Therefore, although feedback in a team assessment may be simply at the task execution level, it is reasonable to expect that students, with strong metacognitive skills, could develop effective learning strategies from that feedback. The students may, for example, develop the skills to diagnose errors and skills such as self-assessment and self-reflection (Chen *et al.*, 2018).

In addition to the dimensions of feedback, there is debate on the effectiveness of the timing of that feedback (Kulhavy & Anderson, 1972; Kulik & Kulik, 1988). Timely and informative feedback can help students recognise and correct knowledge gaps and misunderstandings, motivate them to construct new knowledge, and increase the students' confidence (Epstein *et al*., 2002).

4.2.5 Immediate Feedback

Immediate feedback in the classroom, as opposed to delayed feedback, appears most effective as it increases a student's confidence and motivation to learn (Dihoff, Brosvic & Epstein, 2003; Dihoff, Brosvic, Epstein & Cook, 2004). Immediate feedback reduces interference from incorrect knowledge (Epstein *et al*., 2002) and may limit repetition of retrieval failure (Roediger & Marsh, 2005). During an assessment, immediate feedback provides an opportunity to potentially realise the positive effects of feedback, while avoiding the students' disregard of feedback received with the later release of test scores (Schneider, Ruder & Bauer, 2018).

Although immediate feedback during assessments has been found to be beneficial for learning (Brosvic & Epstein, 2007), it is exceptionally difficult to provide timely individual feedback in the large classes that characterize many higher education courses at the undergraduate level (Chen *et al.*, 2018). Many instructors therefore provide generalized feedback for the group and leave it up to the students to decide how and when to use this

generalized delayed feedback (Schneider, Ruder & Bauer, 2018). Peer feedback may serve as an alternative to instructors providing immediate feedback in large classes.

4.2.6 Peer feedback

Historically, peer feedback was characterized by the assessment and grading of a student's work by their peers (Topping, 1998). Such unilateral feedback is, however, unlikely to lead to greater learning (Crisp, 2007). Contemporary literature, therefore, encourages less emphasis on grading as feedback and greater emphasis on peer review, whereby students evaluate and share feedback on each other's work through social interaction (Liu & Carless, 2006; Nicol, 2013; Orsmond *et al*., 2013). Through social interaction, the students are able to make sense of their new knowledge and develop greater conceptual understanding (Orsmond *et al*., 2013). In addition to encouraging social interaction, peer feedback encourages active learning, self-assessment, self-management and develops subject knowledge (Liu & Carless, 2006). Further, the benefits of peer feedback extend beyond the education environment and assists students prepare for their careers in practice, by developing their ability to evaluate the work of others and to communicate that evaluation to others (Liu & Carless, 2006).

This study explores students' experiences of TAIF in a large, culturally diverse undergraduate professional accounting education course in which immediate formative feedback is given to the students by their peers and the Immediate Feedback Assessment Technique (IF-AT®).

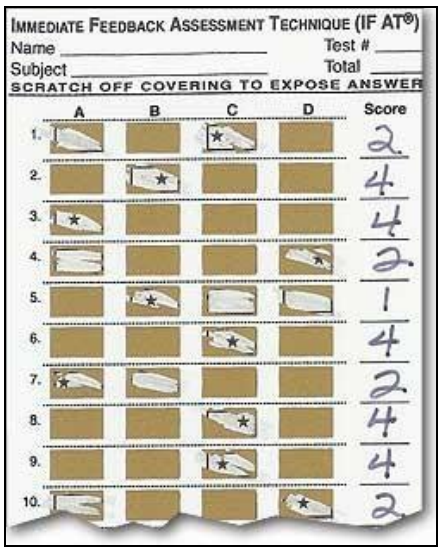
4.2.7 Immediate Feedback Assessment Technique (IF-AT®)

In large classes, the multiple choice format is often selected for assessment (Henriques, Colburn & Ritz, 2006). The multiple choice format reduces grading time and is a reliable assessment method (Schneider, Ruder & Bauer, 2018). It is, however, challenging to assess critical thinking and problem solving skills with multiple choice questions and often many questions may be guessed by a student without a full understanding of the content. Feedback on multiple choice questions is regularly limited to what the correct answer is and not on the student's (mis)understanding of the concepts assessed. Reading or

endorsing the incorrect distractor option can result in the construction of incorrect knowledge (Butler, Marsh, Goode, Roediger, 2006; Roediger & Marsh, 2005). Providing corrective feedback in these circumstances is particularly important for less prepared students who experience larger negative effects (Butler & Roediger, 2008). The limited feedback associated with the multiple choice format in large classes can be overcome by allowing students multiple attempts for reduced credit (Slepkov, Vreugdenhil & Shiell, 2016). Further, the awarding of partial credit may increase test scores and discourage students from merely guessing answers on subsequent attempts (Slepkov *et al.*, 2016).

Unlike the traditional multiple choice form (e.g. the Scantron form), the Immediate Feedback Assessment Technique (IF-AT®) (Epstein, Epstein & Brosvic, 2001; Epstein *et al*., 2002) makes use of a multiple choice answer card that allows students multiple attempts for reduced credit (DiBattista, Mitterer & Gosse, 2004). The card contains rows of responses for each question with each option in a row of responses covered in a thin opaque film similar to that of a scratchable lottery card (Parmelee, Michaelsen, Cook & Hudes, 2012). Students scratch off the coating on their preferred response with a coin, student card or similar. Immediate feedback in then provided to the student by the presence of a star appearing somewhere within a rectangle, which indicates the correct response has been selected, or a blank space indicating an incorrect response. If the first response is incorrect, the student may make multiple attempts for reduced credit. In the example provided of an IF-AT® form (Figure 4.2), 4 points are awarded for a correct first attempt, 2 points for a correct second attempt and 1 point for a third attempt that proves to be correct. Instructors may apply their discretion at determining the awarding of the points for each attempt.

Figure 4-2: An example of a completed IF-AT® form



Students in introductory psychology courses positively experienced the use of = IF-AT® forms in an individual assessment (DiBattista, Mitterer & Gosse, 2004; Epstein *et al*., 2002). The students commented that the IF-AT® assessment felt like a game contributing to their learning (DiBattista & Gosse, 2006) and reducing their anxiety associated with the assessment (DiBattista & Gosse, 2006; Epstein *et al*., 2002). Within the science domain, the use of IF-AT® forms within a team context has been explored (Carmichael, 2009; Cotner, Baepler & Kellerman, 2008; Slepkov & Shiell, 2014; White, 2005). Again the students' experience of the IF-AT® forms has been positive. Students commented that the IF-AT® forms assisted in identifying misconceptions in their learning and improved their academic performance (Cotner *et al.*, 2008). The prior literature on the use of IF-AT® forms is concentrated in the traditional knowledge-based higher education environment as opposed to a more vocation competency-based professional higher education environment. This study extends the existing literature by considering the use of IF-AT® forms in a large, competency-based professional accounting education course, characterized by multicultural teams.

4.2.8 TAIF in a large accounting class

In the course in which the TAIF was adopted, the class meets 3 times a week for a total of 4 hours instruction per week. Knowledge creation is facilitated by the Guided Inquiry

Design® Framework. Guided Inquiry Design is a linear looking process, based on the constructivist theory (Vygotsky, 1978), guiding students through the process of constructing new knowledge (see https://guidedinquirydesign.com/gid/ for more information). Learning is facilitated by a combination of team-based learning, case-based teaching and problem-based learning. Teaching practices include video-based tutorials, lectures, role play, interactive problem solving sessions with immediate feedback using Google Forms, small group discussions, and think-pair-share sessions. TAIF was, therefore, a natural extension of these classroom practices.

At the beginning of a semester, students were clustered into groups based on their prior academic achievement in an introductory accounting course. The students were then randomly drawn from each cluster forming teams of approximately 4 students. Each team, therefore, included academically stronger and weaker students, based on the students' prior academic performance. A numerical sorted list, based on student numbers, was published, indicating the name of each student's team they were allocated into next to their student number. Students were not informed of the reason they were allocated into teams. The students were requested and regularly reminded to memorise their team name for the use thereof at an undisclosed time during the semester.

The TAIF was administered mid-semester during a time scheduled for an individual written summative assessment, typical of the course and degree program. The intention, therefore, was that each student be optimally prepared for the assessment, minimising the risk of any 'freeloading' during the TAIF. Upon arrival at the assessment venue, students were requested to locate their teams, based on the team names that had been positioned at various points throughout the venue. Before commencement of the assessment, the instructors spent time describing the assessment to the students in detail, on the assumption that students had no prior experience of the IF-AT® format. The instructions focused only on the practical use of the IF-AT® form and did not include any suggestions or guidance in respect of the teamwork component or the approach to developing a response to each question. It was left to each team's discretion to determine the roles of each member in the team and to strategize their approach to the assessment. In general it was observed that one student would take, or be assigned, the responsibility to do the scratch off on the IF-AT® form, as each team was assigned only one IF-AT® form. Team

members were all at rapt attention as they determined if their response was correct. Audible cheers or groans were given to correct or incorrect responses respectively. Discussion invariably became more passionate and urgent should the first attempt be wrong and the stakes became higher. The students were allowed to reposition themselves and their teams in the venue. While there was no audio insulation between teams, the students seemed to be sufficiently focused on their own discussion so that other teams' discussions did not appear to affect them.

The assessment purposefully expected greater insight than an individual, written summative assessment to encourage collaboration, problem solving and productive discussion amongst the team members (Jang *et al.*, 2017). Designing an assessment of high difficulty is important to ensure even higher-ability students are open to the thinking of their peers (Jang *et al.*, 2017). The assessment is available at: https://goo.gl/eq1sD9. The level of difficulty of this assessment as opposed to the traditional summative *assessments of knowledge* was validated, in line with the university quality assurance procedures, by an external examiner who is an expert in the course content. The TAIF counted for credit and contributed approximately 2.1% of the students' final grade. The point distribution selected for correct answers was 6, 4, 2 or 0 points awarded for the first, second, third or fourth attempt, respectively. However, despite the allocation of credit, the students' grade in this *assessment for learning* was a secondary consideration to the creation of an opportunity for students to collaboratively develop various competencies. The assessment was scheduled for two hours and comprised of 7 high-difficulty questions.

4.3 METHOD

In addition to providing a description of the development of the TAIF, this study explored students' experiences of the assessment. Given the limited literature relating to TAIF in a large culturally diverse classroom in a competency-based environment, a mixed methods approach was adopted to investigate the lived experience of the students in the process. Understanding more about their experiences may potentially enable the process of TAIF to be improved and advance the literature on TAIF. The methodology for this study therefore borrows from phenomenology (Husserl, [1900] 2002), in that it seeks to understand the phenomenon of a TAIF through the eyes of the people experiencing it. An interpretive

phenomenological approach is suited to '"What's it like for them?" studies' that can provide "startling new insights" into complex education related issues (van der Mescht, 2004:1).

4.3.1 Survey approach

A survey approach was adopted to collect quantitative and qualitative data pertaining to the students' experience of the TAIF. The survey approach allowed data to be collected from all students who undertook the team assessment. Quantitative data were generated using a yes / no response and a scaled Likert-attitude response (1 - extremely negative to 7 - extremely positive). Open ended questions were used to collect qualitative data, to gain a deeper understanding of the students' lived experiences of undertaking a TAIF. The survey instrument questions are presented in Table 4.1.

Table 4-1: Survey Instrument Questions

● Would you want to be assessed again in this manner during your degree?
● On a scale of 1 (extremely negative) to 7 (extremely positive), rate your overall experience of the team assessment.
● Tell us about your experience of the team assessment – how was it for you? (describe the process from start to finish and how it felt - what was going on for you/others, what worked or did not work for you)
● What was it like giving yourself a grade? How did it feel? Why was that?
● How would you rate the team assessment compared to other forms of assessment that you have experienced during your degree thus far?
● What all do you think the team assessment was actually assessing?
● If you designed this assessment what would you do differently and why?
● Is there anything we should have asked you about in your reflection, but haven't?
● Why would you, or why would you not, want to be assessed again in this manner?
● Is there anything further that comes to mind in your reflection that you would like to add?

The questions posed in the survey instrument are based on those used in another study exploring collaborative assessment of placement learning (Cooper, 2017). The survey instrument was independently reviewed for the design and the clarity of the questions. The

review resulted in no amendment to the survey instrument. The survey instrument was delivered using *Google Forms* following approval from the institutional review board.

4.3.2 Analysis

The quantitative data were analysed in SPSS Statistics 21. Descriptive statistics (e.g. mean, median, standard deviation and percentage of response) and frequencies were calculated and an initial data integrity check performed. A Chi-square test was employed to compare the proportions of categorical variables between different demographic characteristics; where the expected count of a cell was less than 5, a two-tailed Fisher's Exact test was applied instead (Field, 2013). As parametric statistics can be used to analyse Likert data (Norman, 2010; Sullivan & Artino, 2013) an Analysis of Variance (ANOVA) test was used to compare the mean (standard deviation) of the Likert scale data between different demographic characteristics.

The qualitative data from the survey instrument were analysed using a thematic approach (Cooper, 2017). Initially each response was read and re-read to begin the process of open coding, identifying themes that were significant in relation to the participants' experiences of the team assessment. In the initial analysis, descriptive codes were assigned to each statement made by the students. Basic themes were developed and coded using NVivo 12. Codes were checked for repetition and similar codes then grouped to develop organising themes (Cooper, 2017). The process was repeated at a later point in time. Discrepancies between the initial and subsequent analysis were scrutinised and resolved. Thereafter the two sets of coding were scrutinised together and differences between the coding sets resolved through discussion and mutual consensus.

4.4 RESULTS

4.4.1 Descriptive statistics

The majority of students experienced the TAIF positively (M=5.95; SD=1.145) (Table 4.2). 75% of the students rated their overall experience as 'positive' or 'extremely positive'. A statistically significant difference was identified between the male (M=6.19; SD=0.912) and

female (M=5.78; SD=1.258) students (F=10.123; p=0.002) rating of their experience of the team assessment. Significantly more female students (n=24; 7.5% of total respondents) than male students (n=5; 2% of total respondents), rated their experience negatively (4 or lower on the Likert scale). There was no statistically significant difference between the different cultural groups (F=1.783; p=0.170) rating of the overall experience. 93% of the African[13] students, 90% of the White students, and 89% of the students from the other[14] cultural groups rated their overall experience positively (between 5 and 7 on the Likert scale).

The majority (91%; n=291) of students indicated that they would like to experience a TAIF again. There was no statistically significant difference between male and female students ($x^2(1)=1.675$, p>.1), or students form different culture groups (African, White, Other) (p>.1, Fisher's Exact test).

Table 4-2: Students' experience of TAIF

	Would you want to be assessed again in this manner during your degree?		**On a scale of 1 (extremely negative) to 7 (extremely positive), rate your overall experience of the team assessment.**
	Yes n	**No n**	**M (SD) / Median**
Total (n=321)	291	30	5.95 (1.145) / 6
Gender			
Male (n=131)	122	9	6.19 (0.912) * / 6
Female (n=188)	167	21	5.78 (1.258) * / 6
Culture			
African (n=151)	136	15	6.05 (1.153) / 6
White (n=125)	112	13	5.80 (1.178) / 6
Other (n=45)	43	2	6.02 (0.988) / 6

[13] This study uses 'African' to refer to black indigenous or native South Africans.

[14] 'Other' represents several population groups including Asian, Chinese, Indian and Mixed-race students.

* Statistically significantly different on the 1% level

Further analysis of the team assessment experience by gender highlighted three outlying teams. These teams comprised primarily (85%) of female students who rated their overall experience negatively. These teams received the only failing grades (48%) for the assessment (the average percentage achieved for the assessment was 80%). Analysis of the responses, received from the students in these teams to the open ended questions, suggested that there was unresolved conflict between the members, primarily due to the differing academic abilities of the team members.

4.4.2 Qualitative analysis

The qualitative analysis provided further insights into the students' experience, of the TAIF and aspects thereof that may need to be improved, to enhance its effectiveness. From the outset the students differentiated the team assessment from other group work activities. Comments such as *"It was interesting to interact with fellow classmates, working together to achieve a common goal"* allude to the subtle but significant difference of 'group work' referring to individual accomplishments within a group context and 'teamwork' referring to collaborative and interdependent efforts towards a common goal (Wilson, Ho & Brookes, 2017). The goal in this instance being a passing grade for the team in the team assessment. The students' general positivity towards the team assessment was again evident in the qualitative analysis. Much of this positivity was ascribed by the students to the opportunities for learning that the team assessment provided. *"This was the greatest, coolest, most innovative and frankly the test that I have learnt the most from, not just during my degree thus far but in my entire schooling career."*

The students noted they had constructed new knowledge and understanding of the content from collaborating with their fellow team members. "[*H*]*aving other people's input actually helped me understand the concepts a lot better".* Through collaborating, their fellow students were effectively guiding their knowledge creation in their zones of proximal development. *"[S]omeone would question my line of thinking when they got a different answer and help me to focus on things I don't yet fully understand".* "*My own assumptions were tested and either proven, or corrected, while giving me an understanding of the common misconceptions I tend to make". "It help[ed] me see … the gaps in my*

knowledge. It was a great learning experience". The construction of knowledge was not only through the scaffolding received from other students, but also by providing scaffolding to others. "*I had the kind of group members who would ask you to explain why you thought a certain option was the answer, so I had to have understood the concept well enough to not just give an answer, but also explain why and give reasons behind how and why I calculated amounts the way I did".* The value of this social constructivist form of knowledge creation was evident in students' acknowledgement that *"I learn[t] a lot more in this type of scenario than when I read out [of] a textbook"* and "*I got to understand the topic better than I had previously understood it on my own"*.

The students further acknowledged that the team assessment provided "*a great opportunity to practice some soft skills"*. A broad range of generic (or soft) skills were listed by the students. To assist in the classification of these skills, they were mapped, in *italics*, against the competency areas for generic skills prescribed by International Education Standard 3 (Revised) (IES 3), *Initial Professional Development – Professional Skills*[15]:

- Intellectual skills: *integration, evaluation of thought processes, argue critically and constructively, problem solving, how to formulate answers, critical thinking, analysing*;
- Interpersonal and Communication skills: *listening, debating, to explain concepts clearly, convey knowledge, share ideas, social, interactive, negotiation, managing different personalities, understanding others' point of view, tolerance, patience, seeing another perspective, collaboration, teamwork*;
- Personal skills: *confidence in yourself and your knowledge, participation (for introverts), working out of your comfort zone, coping with stress and pressure, assertiveness, ability to adapt*; and
- Organizational skills: *time management, leadership, conflict management, learning to trust each other, delegation, work with people you have never met before, come together and work towards a common goal, create an inclusive and comfortable environment for people to express their opinions*.

Many students highlighted that not only had they constructed new knowledge and understanding of the content and practiced numerous skills during the team assessment,

[15] The South African Institute of Chartered Accountant's competency framework for initial professional development (SAICA, 2018) includes prescriptions for skills development based on *International Education Standard 3 (Revised)* (IES 3), *Initial Professional Development – Professional Skills*.

but they also improved their learning strategies. *"It allowed me to reflect on how I answered the questions, my thought processes regarding the questions, how efficiently I use my time and it was an indication for me to see how well I knew my work and if I had studied hard enough or if my study method for [the course] worked."* Many students commented that the team assessment enabled them to improve their 'exam technique': *"...not only did I come out with more knowledge of the topic but also different ideas of how to approach questions which will be very useful"*. "[*I*] *personally learned a way to approach questions in a test situation by observing how my peers approach questions in a test situation".* Some students, however, commented that the team assessment did not prepare them for future traditional summative assessments, including comments such as *"I would not like to be assessed in that manner because at the end of the day it is not realistic. Other assessments throughout our degree are not going to be tested in this manner thus we need to be constantly put under those high pressure conditions"*. Such comments may confirm the ingrained fixation of instructors, the profession and students with pass rates in professional accountancy examinations (Coetzee & Schmulian, 2012; Wilson, 2011).

The unexpected nature of the team assessment provided some initial anxiety. *"At first I felt extremely uneasy about the whole idea of doing a test in a team due to the uncertainties that go along with teamwork as well as possible disagreements"*. The ability to adapt was one of the outcomes envisaged for this assessment for learning, and comments including *"I learned a very valuable lesson from this experience. Sometimes we can prepare ourselves for something only for the circumstances to change. This [is] how the real world works and the successful people in this world are not just who plan but who are also able to adapt to changes in circumstances"* suggest that this outcome was achieved.

Many students identified the authentic nature of the team assessment as replicating their future workplace. *"Being able to work efficiently as a group whilst adhering to stringent time frames is commonplace in the audit environment"*. The random allocation of culturally diverse students allowed the students "*to meet people that you have never even seen in class before"* and "*it was great … we became friends quickly*". This random allocation further contributed to the authenticity of the team assessment:

"I feel the collaborative assessment was a way for us to engage in teams, regardless of race, background and gender. In my team there was Black, White, Indian and Chinese. It was a mix of cultures and personalities in one team. Some were introverts and some were extroverts, but regardless of what type personality each person was, we all broke out of our own bubbles and did what had to be done - do well in the test. I found out that we are actually not all that different. We all have one common goal, and that is to become Chartered Accountants. In the workplace, there's going to be people who look different from us, but that doesn't take away their ability to do their work. In fact, we could all learn from one another and achieve good things together. Our clients are also not going to be the same kind each time. We were assessed on our ability to adapt to a unique and unfamiliar environment / situation and based on our willingness to work together, we did well".

Some negativity towards the random allocation of students into groups was experienced, due to the assessment counting towards their final grade for the course. *"I would rather be allowed to choose group members I know, as we all know our strengths and weaknesses, as opposed to being put with people I do not know at [all], potentially putting my grade at risk"*. However, this assessment was not focused only on the summative *assessment of knowledge*, but integrated formative *assessment for learning* to facilitate the students' construction of knowledge, and generic skills development.

Formative feedback is an essential element of competency-based *assessment for learning*. Feedback is received by the students through collaborating with their peers during the team assessment. Additionally, the students received immediate feedback as to the correctness, or not, of their response from the IF-AT® form. This was experienced positively. *"Being able to learn from mistakes I made while they are still fresh and I can remember how that happened so that I can correct them". "Instead of getting the whole question wrong on your first attempt, you can still rectify your mistake". "*[*I*]t *gave me the opportunity to [then] go home and revise my weak areas in [the course] and attempt the question again to see if I understood the work better".* In addition to the immediate feedback, the use of the multiple choice format with multiple attempts and reduced credit allocated per attempt, may have motivated the students to not guess answers (Slepkov *et*

al., 2016). *"Empowering or rewarding almost, you got to know whether you were right or wrong immediately as a group, and if right, the entire group would be happy and excited. If the answer was wrong, you were determined as a group to find the correct answer next"*.

While the learning benefits of the immediate feedback were widely acknowledged by the students, there was some acknowledgement of the stress associated with the immediate feedback. *"You feel very nervous and scared when you scratch the card, as you do not know if the answer is right or wrong, and you know that if it is wrong, you will be loosing marks"*. However, once the total mark was known, the stress appears to have dissipated, *"I cannot emphasize enough how much I loved knowing my mark as I walked out of the venue ... I find it difficult to be at peace attending classes, doing homework, sleeping etc. when my mind is constantly mauling over the uncertainty of what my marks are and when the bomb was going to be dropped"*. Also, the students appear to have been less anxious while writing than during a formal summative assessments of learning. *"It's unorthodox which is refreshing. We all expected a quiet test room with everyone stressing. But it was full of communication and discussion which was really nice to see"*.

To bridge the perceived divide between an assessment preparing students for practice and the traditional summative assessments of knowledge, many students suggested that they "... *would let the students do the questions individually first so that each one can apply their own unique thought process to understand. For example, I prefer to read the question alone and interpret all important points to myself before I can discuss it with the next person. And I would let the students know that they are going to work in groups and still emphasize that individual work will be assessed so that they do not come unprepared, believing they will just get help from others"*. This approach to the TAIF has recently been suggested (Jang *et al.*, 2017). However, in strategizing their approach to the assessment, many students in any event described their team's approach as one in which each student worked through the questions individually first, before discussing it in the team and reaching a conclusion on which answer to scratch. As an alternative to an individual assessment component, many students confirmed the unexpected nature of the team assessment with no pre-warning minimised the freeloader risk of team assessment. The students warned that "... *for future purposes it could be a possibility that students will study*

less well for the test if they know it is a collaborative assessment as they may expect to rely on their group members knowledge".

4.5 DISCUSSION

The purpose of the TAIF was to broaden a traditional summative *assessment of accounting knowledge* to integrate a formative *assessment for learning*, to construct knowledge and develop various generic skills expected by many professional accounting associations' competency frameworks and by employers. It is argued, based on the students' perceptions of the TAIF, that the TAIF was able to achieve this purpose, although future research exploring actual learning gains is encouraged to corroborate the students' perceptions.

In terms of Vygotsky's theory of social constructivism, every conversation between two or more people presents an opportunity for knowledge construction (Vygotsky, 1978). The students perceived that they constructed new knowledge by collaborating with other students towards the 'common goal' of attaining a passing grade for the summative assessment of knowledge. Through social interaction, the students may have received scaffolding in their zones of proximal development from their peers and provided scaffolding for others' knowledge construction. The students perceived that they assisted each other, in identifying gaps between their current understanding and the desired level of understanding necessary to complete the assessment, by providing formative feedback to each other. Further, the students perceived that this feedback assisted them in developing more effective learning strategies and 'exam technique'.

However, for some students, the social interaction resulted in unresolved conflict with peers, leading to these students not receiving a passing grade for the summative *assessment of knowledge*. It is suggested, for this reason, that student groups be changed for subsequent team assessments, to allow these students a 'fresh' opportunity to collaborate with other students. Further, the students can be assisted with particular interventions and teaching cases (for example the Harvard Business School Mount Everest--1996 Case (Roberto & Carioggia, 2003)) to develop their conflict management and collaboration skills.

In addition to conflict management and collaboration skills, the students suggested that the TAIF afforded them the opportunity to develop generic skills across all the competency areas prescribed by the *International Accounting Education Standards Board* in IES 3 namely, intellectual skills, interpersonal and communication skills, personal skills and organizational skills. In particular, the team assessment allowed the students to develop their problem solving and communication skills, which have been identified as particularly important in the workplace (Tabary, 2015). Further, the students suggested that the TAIF aided in improving teamwork, which has been identified as being inadequately developed in accounting graduates (Bui & Porter, 2010; Wells, Gerbic, Kranenburg & Bygrave, 2009). Based on the students' perceptions, the team assessment may contribute towards re-establishing the link between theory and practice. From the employers' viewpoint, the development of generic skills at higher education institutions meets a long expressed need (Jackling & de Lange, 2009). From the students' viewpoint, the assessment provided the students with an authentic replication of their future workplace which requires them to successfully collaborate in high stakes situations.

A characteristic of the 21st century workplace is the high level of internationalization, necessitating accounting graduates to be able to work with people from different cultures. Higher education has also globalised, and heterogeneous classes, comprising students from various cultures, are increasingly common (Coetzee, Schmulian & Kotze, 2014; Donald & Jackling, 2007; Hammond, Clayton & Arnold, 2009). Through requiring students to collaborate in multicultural teams, the team assessment allowed students the opportunity to improve their cultural awareness and positivity towards collaborating with people of differing backgrounds, a particularly important skill in post-Apartheid South Africa's cosmopolitan business environment.

Another characteristic of many higher education courses at the undergraduate level is large classes. It is exceptionally difficult to provide timely individual feedback in large classes and the course has historically been characterized by the instructors providing generalized and delayed feedback on summative assessments to the group and leaving it up to the students to decide how and when to use this generalized delayed feedback. The team assessment provided the students with the opportunity for individualized formative

feedback from their peers. Future research is, however, encouraged to evaluate the nature of the peer feedback through, for example, analysis of the dialogue between team members during a TAIF.

In addition to formative feedback from their peers, the students received immediate feedback from scratching the IF-AT® form. Although this feedback is simplistic, in that it only indicates for each attempt whether the team is correct or not, the feedback is immediate, unlike a traditional multiple choice assessment. This immediate feedback enables social learning during the assessment, as students discuss their next attempt in their teams. This feedback, therefore, allows the students to learn from their mistakes while these are still 'fresh' in their memories.

4.6 CONCLUSION

This study extends the literature in a number of respects. Firstly, this study demonstrates the students' perceptions of the effectiveness of TAIF in allowing them to socially construct knowledge and develop generic skills in a high stakes summative assessment environment. Secondly, this study provides insights into the use of TAIF in facilitating competency-based learning in a culturally diverse large class setting.

The majority of students surveyed in this study experienced the TAIF positively. Several generic skills were perceived as being developed by the students during the competency-based team assessment, while the assessment also created an opportunity for social constructivist learning. Further, this study provided some initial evidence that a team assessment in a culturally diverse student cohort may enhance intercultural collaboration.

While a single site study of a particular intervention may limit the generalization of the study's findings, this study provided a thick description of the development and facilitation of a TAIF, as a competency-based collaborative learning technique. Further, this study drew qualitatively on the experiences of the TAIF of a large cohort of students, and this phenomenological approach provided valuable insight into this collaborative learning technique in a professional education environment.

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5 CHAPTER 5: CONCLUSION

5.1 INTRODUCTION

The International Accounting Education Standards Board (IAESB) encourages the implementation of a learning outcomes approach to accounting education (IAESB, 2016). Emerging from the broader outcomes-based approach is the competency-based approach, which is focused on competencies that are essential for success in a particular profession (Abbasi, 2013; Blank, 1982; Bolt-Lee & Foster, 2003; Boritz & Carnaghan, 2003; Spady, 1977), resulting in numerous professional accounting bodies developing competency frameworks. Implementing an outcomes- or competency-based approach, necessitates a change in pedagogy towards a constructivist approach to education (Griffin, 1998). Failure to adopt a constructivist approach risks pedagogy that focuses only on observable and measurable competencies, rather than all competencies required of a professional accountant (Malone & Supri, 2012; Norman, Norcini & Bordage, 2014; Ten Cate and Billett, 2014).

The objective of a constructivist approach to education is to allow students to construct knowledge based on prior experience (Boghossian, 2006; Ertmer & Newby, 1993) and to create meaning rather than acquire it (Hung, 2001; Richardson, 2003). Students construct knowledge and create meaning by actively filtering inputs from the world through personal interpretation of their experiences (Bednar, Cunningham, Duffy & Perry, 1992). The students' knowledge is therefore dynamic and constantly open to change in response to changes in their lived experiences (Boghossian, 2006; Nalliah & Idris, 2014).

At the classroom level, implementing a constructivist competency-based approach translates into the role of the instructor needing to change from a transmitter of information to a facilitator of learning, and instructors needing to embrace a range of resources to assist the students achieve the designated outcomes or competencies (Griffin, 1998). Also, assessment requires a shift away from isolated, high stakes, point-in-time traditional summative assessments to more formative assessment methods, emphasising assessment for learning (Harris *et al*., 2017).

5.2 SOCIAL CONSTRUCTIVISM

Within the constructivist domain, there is increasing acknowledgement that learning is a social-based process (Laurillard, 1995; McLoughlin & Luca, 2002), where every conversation or encounter between two or more people presents an opportunity for new knowledge to be obtained, or current knowledge to be expanded (Vygotsky, 1978). Preceding the construction of knowledge, is a student's 'actual development level' which represents what a student currently understands or can do without the assistance of a more 'knowledgeable other' (Kay & Kibble, 2016). The construction of knowledge beyond the 'actual development level' is then facilitated socially, by means of real life adaptive problem solving with others, through sharing experience and discussing how new ideas match to and expand upon existing knowledge, to allow students to make sense of the world (Adams, 2006; Laurillard, 1995; McLoughlin & Luca, 2002). Vygotsky conceptualized this knowledge construction as learning in a student's 'zone of proximal development' (John-Steiner & Mahn, 1996) where a student's construction of knowledge is supported by a more 'knowledgeable other' (Subban, 2006). The 'knowledgeable other' scaffolds the construction of a student's knowledge or skills towards a socially agreeable interpretation of that knowledge or skill. This scaffolding can include formative feedback on assessments, emphasising assessment for learning, to construct knowledge and develop skills throughout the learning process (Harris *et al*., 2017). As the students construct their knowledge or skills and become independent, the 'knowledgeable other' removes the scaffolding.

This thesis reported on approaches to social constructivist learning in each of the three stages of competency-based learning namely, facilitating learning, scaffolding learning and assessment for learning. In particular, this thesis:

1) considered students' experience of the use of team teaching to facilitate their learning in an undergraduate accounting course. Specifically, the students' perspectives of the relative advantages and disadvantages of teaming, as a form of team teaching, in contrast to the more widely adopted equal status model of team teaching, were explored (Chapter 2: Research Paper 1);
2) provided a thick description of the development of two Messenger bots, Accounting Rookies and IFRS Rookies, and documented potential social constructivist

applications of the Messenger bots in teaching and learning, before exploring students', as end users', preliminary experience of learning with Messenger bots (Chapter 3: Research Paper 2);

3) considered the design and use of a team assessment with immediate feedback in a culturally diverse undergraduate professional accounting education course, as a competency-based collaborative learning technique, and the students' qualitative experiences thereof (Chapter 4: Research Paper 3).

5.3 STUDENTS' EXPERIENCE OF TEAM TEACHING IN AN UNDERGRADUATE ACCOUNTING COURSE (CHAPTER 2: PAPER 1)

Team teaching, involving two or more instructors sharing responsibility and collaborating in presenting a course or subject, represents a means of facilitating learning anchored in social constructivism (Vygotsky, 1978). Through sharing responsibility (Wenger & Hornyak, 1999) and collaborative planning, teaching and assessing (Baeten & Simons, 2014), teachers construct new knowledge about teaching (Kerin & Murphy, 2015; Murphy & Scantlebury, 2010; Roth & Tobin, 2002) that should enhance student learning (Shibley, 2006). Team teaching creates the opportunity for students to learn by observing their teacher team's interactions and by interacting with their teacher team (Topping, 2005), enriching the students' learning experience through exposure to multiple teaching styles and perspectives on the course content (Hanusch, Obijiofor & Volcic, 2009; Nokes *et al*., 2008; Tobin, Roth & Zimmermann, 2001). Team teaching also allows: more opportunity for individualized attention (Birrell & Bullough, 2005); greater differentiation of instruction; additional collection of observational information (e.g. learning problems) (Baeten & Simons, 2016; Bullough *et al*., 2002; Gardiner, 2010; Smith, 2004); improved classroom management (Birrell & Bullough, 2005), and quicker faculty response times to students' queries (Gardiner, 2010). Consequently, team teaching has the potential to increase students' learning gains and test scores (Benjamin, 2000; Colburn, Sullivan & Fox, 2012; Sorensen, 2004).

Team teaching has been extensively explored through the lens of teachers but less so from the perspective of students (Baeten & Simons, 2016). The exploration of students' experience and preference of team teaching in higher education is limited and focused on

the equal status model (parallel, tag rotation or sequential approach) (Colburn, Sullivan & Fox, 2012; Money & Coughlan, 2016). As the equal status model of team teaching is characterized by collaboration in planning, assessment and reflection outside of class, rather than class instruction, the students' evaluation of team teaching is limited to a team teaching model where the collaboration between teachers is not visible to the students in class. The students' experience of the teaming model, where teachers collaborate in the classroom, has yet to be explored. Students' perspectives of team teaching are important, as they are key actors in the teaching process. This thesis therefore explored undergraduate accounting students' perspectives of the relative advantages and disadvantages of teaming, as a form of team teaching, in contrast to the more traditional equal status model of team teaching.

This thesis suggests, on the basis of student perceptions, that instructors and university administrators should consider adopting the teaming model. The teaming model appears to maximise the advantages of team teaching, while replicating the consistency and continuity of the individual teaching model since the instructors do not rotate. The respondent students were statistically significantly more positive about the advantages of the teaming model as opposed to the advantages of the equal status model, with a larger majority of the students indicating a stronger preference to be taught using the teaming model in the future. The teaming model provided students with lectures that, from their perspective, are more interesting and enhance their understanding, and provides students with faster and more individualized support than the equal status model. However, instructors should be aware that the presence of two instructors in a venue may cause confusion and intimidate students and should take mitigating steps in their planning and delivery to reduce any confusion or intimidation experienced by the students.

Of particular concern to administrators is the perceived duplication of work and related costs associated with team teaching (Liebel, Burden & Heldal, 2017), which is magnified in the teaming model with two instructors simultaneously in class. Administrators should, however, consider the educational benefits of the teaming model, particularly in a constructivist competency-based professional education context with large student groups of diverse academic ability, where the potential for increased student interest, understanding and individualized support may be beneficial to student learning.

5.4 THE DEVELOPMENT AND THE USERS' EXPERIENCE OF TWO MESSENGER BOTS, ACCOUNTING ROOKIES AND IFRS ROOKIES (CHAPTER 3: PAPER 2)

Facilitating learning in a constructivist, competency-based environment requires instructors to embrace a range of resources to assist students achieve designated outcomes or competencies (Griffin, 1998). The introduction of bots into Facebook's *Messenger* application in April 2016 offers instructors a new resource with which to possibly facilitate learning. Through careful design, bots may be enabled to individually scaffold students' learning. Early developers of bots found indications of anthropomorphism, being the tendency of users to treat a bot as a human being (Pokatilo, 2016). As a result, the affordances of learning with bots may be framed by social constructivism (Bii, 2013), with the bot serving as the students' 'knowledgeable other'. Additionally, the bot may facilitate basic instructional mediation (Bii, 2013) by providing an interface between the student and a body of knowledge (Cassell, Sullivan, Prevost & Churchill, 2000). In so doing, the bot may empower students to develop their self-knowledge and become independent, self-directed learners. Bots can scaffold a student's learning in bite-sized chunks, using, inter alia, video, animated GIF images, and text messages as part of interactive explanations and examples, and differentiate between students based on a discriminator, such as a student's response to a particular prompt in the interactive explanation or example. A bot can offer a student the most appropriate information or learning experiences relevant to that student's particular learning needs, as identified by their response to that particular prompt. There is no formal research exploring the use of Messenger bots in teaching and learning.

This thesis, therefore, provided a thick description of the development of two Messenger bots, Accounting Rookies and IFRS Rookies, designed to act as virtual 'tutors' for introductory and intermediate accounting respectively to enable instructors to develop their own Messenger bots for teaching and learning. This thesis then provides examples of potential social constructivist-based applications of Messenger bots in teaching and learning.

Accounting Rookies and IFRS Rookies have been used in various pedagogical scenarios, commonly faced by instructors. To support the flipped classroom, the Messenger bots

were designed to encourage students to watch specific videos or read specific material on the content before asking the students various questions in a quiz style format. To assist the facilitation of learning in large student groups, instructors 'team taught' with a Messenger bot fulfilling a support role. In this role the Messenger bot may, for example, respond to frequently asked questions and interject with additional examples or explanations for students that may require these.

This thesis reported that the students' (as end users') experience of collaboratively learning with the two Messenger bots was positive. In particular, the students suggested that learning with the Messenger bots allowed them to experiment with new ways of learning online, afforded them flexibility in their learning, assisted their knowledge creation and construction, and created opportunity for reflection. However, despite the number of benefits identified of social learning with the Messenger bots, there was acknowledgement from the students that at present the Messenger bots should supplement, rather than replace, face-to-face classroom facilitation of learning.

Development of a Messenger bot requires no coding knowledge on the part of instructors and the ability to facilitate social constructivist learning is a skill that instructors specialize in. This thesis therefore suggests that instructors, rather than programmers, should take ownership of developing Messenger bots for teaching and learning.

5.5 THE USE OF A TEAM ASSESSMENT WITH IMMEDIATE FEEDBACK IN A CULTURALLY DIVERSE UNDERGRADUATE PROFESSIONAL ACCOUNTING EDUCATION COURSE (CHAPTER 4: PAPER 3)

Grounded in Vygotsky's theory of social constructivism, there has been increasing evidence that learning is a social-based process, where communication and negotiation skills come into play when a learner faces new challenges in authentic problem solving (McLoughlin & Luca, 2002). Team assessment, involving small groups of students collaborating towards achieving a common goal, has been suggested as a social-based collaborative learning technique (Jang, Lasry, Miller & Mazur, 2017), placing emphasis on learning through authentic interactions, collaboration and teamwork that improves students' academic performance (Jang *et al.*, 2017; Opdecam, Everaert, van Keer &

Buysschaert, 2014). Additionally, collaborative learning creates a more comprehensive competency-based learning environment than an individual learning environment, by broadening the generic skills that can be developed (Jang *et al.*, 2017; Wilson, Ho & Brookes, 2017).

Despite evidence of team assessments' effectiveness in the broader literature (see Jang *et al.*, 2017), there is limited exploration thereof in the accounting education literature (Clinton & Kohlmeyer, 2005; Gabbin & Wood, 2008) and the generalizability of these results is uncertain (see Bay & Pacharn, 2017; Reinig, Horowitz & Whittenburg, 2014). Further there is limited exploration of team assessment outside of culturally homogenous class groups (Moore & Hampton, 2015). Students may prefer collaborating with students of similar backgrounds for various cultural and pragmatic reasons necessitating collaborative activities amongst a diverse student group, to improve students' cultural awareness and their positivity towards intercultural teamwork (Volet & Ang, 1998).

This thesis documented the design of a Team Assessment with Immediate Feedback (TAIF) as a competency-based collaborative learning technique. This thesis further qualitatively explored students' experiences of a TAIF in a culturally diverse undergraduate professional accounting education course. The majority of students experienced the TAIF positively and suggested that they had constructed new knowledge from collaborating with, and receiving feedback from, their peers and from scratching the IF-AT® form. The students perceived that this feedback assisted them in developing more effective learning strategies and 'exam technique'. The immediate feedback also allowed the students to learn from their mistakes while these are still 'fresh' in their memories.

The students suggested that the TAIF afforded them the opportunity to develop generic skills across several competency areas prescribed by the International Accounting Education Standards Board (IAESB), namely, intellectual skills, interpersonal and communication skills, personal skills and organizational skills. From the students' viewpoint, the assessment also provided them with an authentic replication of their future workplace which requires them to successfully collaborate in high stakes situations. Further, through requiring students to collaborate in multicultural teams, the team assessment, based on the students' perceptions, allowed the students the opportunity to

improve their cultural awareness and positivity towards collaborating with people of differing backgrounds - particularly important in post-Apartheid South Africa's cosmopolitan business environment. The TAIF may consequently assist in bridging any perceived divide between an assessment preparing students for practice and the traditional summative assessments of knowledge.

5.6 SUMMARY

The IAESB's support of a learning outcomes approach, or competency-based approach, to accounting education and the resultant adoption of competency frameworks, by numerous professional accounting bodies, necessitates a change in pedagogy by accounting instructors towards a constructivist approach to accounting education. This thesis reported on the use of various approaches to social constructivist accounting education at three stages of competency-based learning namely, facilitating learning, scaffolding learning and assessment for learning.

Social constructivism views learning as a social-based process where knowledge is created by social interaction. Students become active participants in the learning process and every conversation or encounter between the students and a knowledgeable other presents an opportunity for learning. Teaming, as a model of team teaching, may be a useful form of facilitating social constructivist learning. The teaming model provides more opportunity for individualized interaction between the students and the teachers in the team – the knowledgeable others. In large accounting courses, the facilitation of learning may be further supported by Messenger bots designed to act as a knowledgeable other in scaffolding students' learning, through interactive conversation, between the students and the bot by means of mobile instant messaging. The TAIF provided a further opportunity for social interaction with a knowledgeable other – a fellow student.

In each instance, the knowledgeable other assists the students gradually construct their knowledge towards a socially agreeable interpretation of that knowledge. While teaming and the Messenger bot enabled learning through social interaction between the student and teacher or bot individually, the TAIF, in particular, maximised the opportunity for collaborative social interaction between a student and a group of peers. These social

constructivist approaches encourage active learning in a social manner and the development of outcomes or competencies that may have previously been ignored as they may be difficult to measure, such as teamwork and collaboration in culturally diverse teams.

5.7 CONTRIBUTION

There is little to no literature exploring:

1. students' experience and preference of teaming as a form of team teaching in higher education;
2. the use of Messenger bots in teaching and learning;
3. the use of a summative team assessment integrating formative immediate feedback in competency-based professional higher education or outside of culturally homogenous class groups.

This thesis therefore makes an independent and original contribution to knowledge in respect of specific social constructivist approaches to competency-based accounting education namely, teaming as a form of team teaching, the use of Messenger bots and team assessment with immediate feedback. In particular this thesis provides insights into:

1. the students' perspectives of the teaming model of team teaching;
2. the students' overall satisfaction of learning with the Messenger bots;
3. the students' experiences of the team assessment with immediate feedback and insight into this collaborative learning technique in a professional education environment.

In addition this thesis makes the following specific contributions to the practice of social constructivist teaching:

1. Informs stakeholders' (university administrators, instructors and students) decisions in respect of adopting and supporting teaming as a teaching model.

2. Provides a thick description of the development of two Messenger bots, Accounting Rookies and IFRS Rookies, designed to act as virtual 'tutors' for introductory and intermediate accounting respectively, and suggesting potential social constructivist-based applications thereof, to enable other instructors to develop their own Messenger bots for teaching and learning.
3. Provides a description of the development and facilitation of a team assessment with immediate feedback, as a competency-based collaborative learning technique, to develop accounting students' generic skills.

5.8 LIST OF REFERENCES

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