

ICT Education: Socio-Learning Issues Faced by International Students

Research-in-Progress

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Abstract

Internationalization of education industry has increased the international student intake amongst private and public funded education providers in western countries. However, international students are faced with many challenges in different educational and societal settings of the host country. This study examines a case involving the information and communication technology (ICT) education sector to identify some of the learning and social issues in an international student context. Learning issues relate to understanding of the host country's education framework structure and to application of subject related concepts to real world practice. Social issues relate to linguistic difficulties and cultural diversity in foreign countries. The study proposes to enhance the student' socio-learning experience by using a game based learning strategy aligned with the ICT course structure, to encourage student interactions by having more learning and social exchanges.

Keywords: ICT education, ICT curriculum, learning, social environment, internationalization

Introduction

International students are crucial to the economy of the global education market, since they provide an opportunity to fund the education sector of host countries. There is much competition amongst western countries to increase their international student intake, and they use aggressive marketing strategies to promote international student enrollments. New Zealand (NZ) and Australia are attractive destinations for pursuing higher education as alongside internationally recognized qualifications, they also offer a study-migration pathway (Dzvimbo, 2003). A government report by New Zealand's ministry of education shows total number of international fee paying students were 55,964 in 2013, of which 22,049 pursued tertiary level studies (New Zealand Ministry Education Report, 2013). The growing use of information technology (IT) in day to day life encourages students to choose computing courses as their major field of study in high school and at tertiary level. Further, occupational projections indicate that employment growth between 2008 and 2018 will mostly be related to healthcare and information and communication technology (ICT) sectors (Lacey and Wright 2009), and students may need to be prepared for jobs that do not exist yet (Sipilää, 2014). Thus, ICT is seen as a pathway to future employment, which attracts many local and international students to opt for ICT courses at colleges, training institutes and universities.

New Zealand Qualification Authority (NZQA) is a government body responsible for managing NZ's qualification framework. NZQA administer the secondary school assessment system, provide independent quality assurance of non-university education providers, and set unit standards for qualification recognition from training institutes (<http://www.nzqa.govt.nz>). International students studying ICT courses at non-university organizations set out to achieve the learning outcomes designed by NZQA. The upcoming ICT industry requires students to be proficient in social (client-facing and conversational), technical (programming and designing) and conceptual (analytical and reasoning) skillsets (Bullen et al.

2007, Downey et al. 2008, Lee and Mirchandani 2010). However, migrant students often face both social and learning challenges. Social challenges are related to linguistic and cultural differences, while learning challenges are related to absorbing knowledge of the subject such as understanding conceptual topics in technical areas of study (e.g., database concepts of grouping and aggregation) (Dekeyser et al. 2007).

The purpose of this study is to investigate these issues faced by international students. Two research questions are posed:

RQ 1. What are the challenges faced by international students pursuing NZQA based courses in information and communication technologies?

RQ. 2. How can IT tools be used to overcome these challenges and enhance student learning experience?

A case study involving a non-university education provider is investigated to answer the research questions posed. Our findings reveal several learning and social issues faced by international students. The study findings suggest use of some intervention strategy to bring more social and fun activities within the traditional teaching and learning environment. Pedagogical approach can be made effective by adding fun activities based on technological tools to encourage learning and to address some of the challenges faced by students. We propose using an IT tool supported game based learning (GBL) strategy in a classroom environment to engage students, which will be conducted in a later stage of this study. We anticipate that GBL will stimulate discussions and aid students to learn technical and conceptual topics, while at the same time make students more open to socializing and conversing while studying in a multi-cultural environment.

This section has introduced the background of the study and posed the research sections. The next section reviews literature on teaching and learning pedagogical approaches related to ICT education. Pedagogical thinking geared towards supporting social and learning environments for international students are also discussed. The research design is explained next followed by study findings. The last section discusses the implications of these findings and proposes the next steps to facilitate better social and learning experiences for international students within the current teaching and learning environment.

Literature Review

Academic disciplines can be categorized as pure hard, applied hard, pure soft, and applied soft (Neumann and Becher 2002). Hard disciplines like sciences, engineering and medicine utilize teacher-centered approaches to organizing, structuring and presenting the course for understanding a specific problem domain. Soft disciplines like social sciences and humanities require the teacher to play the role of a facilitator to support knowledge construction process across diverse societal domains (Lindblom-Ylanne et al. 2006). The ICT discipline falls in the applied hard and applied soft domain, as students view conceptual elements which require reasoning and logical skills, alongside practical skills which use the physical environment to exemplify how growing use of technology is affecting people's day-to-day lives. A study found: "Students could not transfer knowledge gained from either lectures or theoretical exercises to practical exercises. Without having direct hardware interaction, students learning becomes abstract, which leads to their displeasure and to the main question: Why we are learning this, and how and where shall I use it?" (Stolikj et al. 2011, p. 340).

Moreover, incorrect perceptions of information technologies may result in learning issues later. Many students entering IT field of study soon find it dry and boring (Sarkar 2006). In an action research project, some practical exercises were set for a networking and telecommunication course in an undergraduate university degree course. The study noted that the practical element was instrumental in engaging and motivating the students and that it improved their performance noticeably. However, a limitation to this approach was the use of campus teaching approach, since the computing laboratories were located in the university grounds (Sarkar, 2006). ICT courses contain conceptual learning, which require application of reasoning and logical skills on tasks such as programming, planning the database design and simulating networking protocols. Several learning issues were found among IT students while applying information retrieval concepts in databases using SQL (Structured Query Language) to notions of joins, groupings and aggregations (Dekeyser et al. 2007). Connolly and Stanfield (2006) found that students had considerable difficulty in analyzing problems when there was no single, simple or well-known solution. "They have difficulty handling the ambiguity and vagueness that can arise during

database analysis. Students can also display an inability to translate classroom examples to other domains with analogous scenarios, betraying a lack of analytical problem-solving skills. For the students these problems can lead to confusion, a lack of self-confidence and a lack of motivation to continue” (p. 462). This again reinforces the suggestion that students pursuing ICT courses often struggle with logical and analytical skills.

Over and above issues pertaining to the ICT discipline, international students also face many other societal issues. These issues stem from diversity in socio-cultural practice, and relate to English language proficiency, financial stress, cultural diversity, and social relationships (Ramachandran 2011; Ippolito 2007). Ramachandran (2011) adds that international students are unfamiliar with the pace, accent, choice of words and terminologies used in everyday activities. The students' confidence goes down when they find that their earlier training in English language and achievements in TOEFL/IELTS do not help them to resolve practical issues that arise in a classroom environment. Moreover, in many countries, the classroom teaching is mainly conducted using the local language, which in turn influences the student's reading orientation, writing styles and communication methods. This has further implications in the thinking process, as analytical abilities and logical concepts have to be translated using English as a medium. Added to this is the cultural shock, which students encounter when they come across diverse religious beliefs, human rights and value systems. Another study identified lower career aspirations in international students resulting from lack of confidence and sense of insecurity (Reynolds and Constantine 2007).

Johnson (2008) assessed classroom activities of universities with many international students in New Zealand. His research estimated that in the first year of study, students had understood between 20 to 30 percent of lecture contents, while the more senior students reported that they still did not understand language used in lectures completely. However, rather than attributing the lack of understanding to students' English language abilities, this can also be attributed to lecturers' accent which ranges across diverse nationalities. Thus, using technological tools to augment classroom teaching can help overcome some of these verbal aspects. Xie et al. (2008) have suggested that a blended learning approach for ICT curriculum will help students to better relate the contents of the course to the real world. The blended approach consists of (1) Classroom: traditional teaching, face to face learning, making notes and completing set exercises, (2) Website: using web-based applications consisting of courseware with online feedback, to support self-paced learning, (3) Actual lab: performing real experiments to give students a first-hand perspective, and (4) Virtual lab: providing an online platform for making simulations through animations to help students visualize different components. Connolly et al. (2006) note a pedagogical basis for developing problem-based learning environments based on visualization and computer games for ICT curriculum. The study suggests using computer games to help IT students overcome these difficulties, as game based learning can be stimulating and enjoyable, which can further build on current research theories of motivation, constructivism, situated learning and problem-based learning. Another study on high school students to evaluate learning effectiveness and motivational appeal of a game which targeted learning of computer memory concepts showed that the gaming approach was very effective in gaining students' understanding of computer memory concepts, besides also providing a solution to 'feeling bored' issue. One student responded: *'It's more enjoyable and active. You never get bored as in traditional teaching because you concentrate on a goal.* (Papastergiou 2009, p. 10). Computer games are thus transformed into social experiences, to offer a constructivist approach that are interactive in nature and generate meaning in learning (Hamalainen, 2011).

Research Design

This study builds on existing literature to gain empirical grounding on the issues identified for international students pursuing ICT education with a higher education provider in New Zealand. The research attempts to answer the two research questions RQ 1 and RQ 2. The study is designed in two stages, as RQ 1 feeds into RQ 2. The first stage of the study has been completed to answer RQ 1. The research design in the first stage entailed conducting interviews with experienced IT tutors who are involved in teaching NZQA based ICT curriculum to international students. Teachers (tutors) play an integral and sensitive part of sociocultural settings of learning environments, and their perspectives are essential in establishing pedagogical models and practices especially in the ICT education sector (Sipilää, 2014). Total five experienced tutors were interviewed. Each interview lasted for approximately one hour.

Each interview was transcribed immediately after the interview to help maintain closeness to the empirical data.

Participants' responses have revealed many perceptions on social and learning issues faced by international students, and also include their suggestions to help alleviate these issues. The findings from interviews suggest using GBL contexts to facilitate active teaching and learning. These suggestions are discussed in the next section, and have led to the research design for the second stage of the study. The second stage will answer the second research question (RQ 2). Accordingly, we propose to use appropriate GBL approaches utilizing fictional problem scenarios based on student's ICT curriculum to engage students and bring fun in learning in the second stage. The case study will target international students pursuing NZQA based ICT qualifications at levels 5 to 7. Levels 5 – 6 refer to diploma levels, while level 7 refers to graduate diploma and certificate levels within the New Zealand qualification system (New Zealand Qualification Framework, 2014). The experiment will involve GBL activities aligned with course modules set by the NZQA body. At the end of taught module, survey data will be conducted from students and tutors to determine the effectiveness of GBL to enhance the student learning experience.

Empirical Findings

This section elaborates on the interview data responses and highlights teacher perceptions on issues faced by international students pursuing ICT courses in the NZQA curriculum. The NZQA curriculum is centered within the New Zealand education regulatory framework, and caters to both domestic or local and international students. Issues faced by international students have been categorized as 'learning' and 'social' issues. Learning issues are those which relate to lack of understanding of course contents as laid out in the curriculum of a foreign country and affect a student's academic performance in the study program. Social issues are not directly related to the curriculum contents, rather are based on real life challenges faced by students in their day-to-day activities in a foreign land. Semi-structured questions were used as they let the participants (ICT tutors) explain their viewpoint based on their teaching experiences and observations with international students. The study specifically targeted international students pursuing ICT qualification of NZQA level 5 to 7. Table 1 summarizes the interview responses (using verbatim interview data) with findings from literature.

Table 1. Literature and Interview Data Summary	
L1	<p>Difficulty in transferring theory knowledge to practice (Stolikj et al. 2011),</p> <ul style="list-style-type: none"> • <i>Things like hardware which exist are easy to relate, which students touch and visualize, but theory part which you cannot touch, is where the students lack confidence in analyzing, for example the structure of programs, or things like syntax which are difficult to reason.</i> • <i>International students mostly come from dependent societies. Their parents decide everything for them from country to college to degree to fees. So, they don't know the whys. Why I will need this? Why is it important? Why is it used?</i>
L2	<p>Difficulty in relating course contents to real industry use (Xie et al. 2008)</p> <ul style="list-style-type: none"> • <i>When they actually get into a course, they don't know where will they employ their skills? Where this skill will be usable? They don't know its applications.</i> • <i>They lack understanding how NZQA unit standard based framework work, and what the differences are between NZQA diploma courses with other college qualifications.</i> • <i>Industry gives more importance to the certification of companies like Microsoft and CISCO.</i>
L3	<p>Lack of interest in course contents (Sarkar 2006, Connolly et al. 2006).</p> <ul style="list-style-type: none"> • <i>The technology moves so fast so when students realize that what they are studying is out dated now then their motivation goes down drastically....we have moved from hubs to switches, but hubs were taken out [of the curriculum] only two years back.</i> • <i>Lack of interest is because they are new to the country and for them it is a big shock, a big shift, so until they get acquainted to washing clothes, being away from family they are lost.</i>

	<ul style="list-style-type: none"> • <i>I have noticed in many organizations that the quality of tutors is not up to the mark and that can affect students' interest in learning.</i>
L4	<p>Difficulty in understanding conceptual topics due to lack of analytical and logical skills (Connolly and Stanfield 2006; Dekeyser et al. 2007)</p> <ul style="list-style-type: none"> • <i>Having no previous experience they cannot relate conceptually to many models like OSI model which is the basic reference model in networking.</i> • <i>They cannot analyze the course material, like when we give them assessment book they have difficulty in understanding difference between 'explain' and 'describe'.</i> • <i>....also when the class strength is over 30 and with limited time available, tutors really cannot give too much individual attention.</i>
S1	<p>Linguistic inequality (Ramachandran 2011; Johnson 2008; Ippolito 2007)</p> <ul style="list-style-type: none"> • <i>Language is a huge barrier – so not knowing the normal business way of talking or contacting the people, they become either too informal or too formal.</i> • <i>Some are scared of stereotypes associated with accents and this makes them hesitate in contacting people.</i>
S2	<p>Cultural diversity (Ramachandran 2011; Reynolds and Constantine 2007; Johnson 2008)</p> <ul style="list-style-type: none"> • <i>Many students find problems to interact with people of other cultures. So they do not take the initiative to start conversation with them.</i> • <i>Coming from a dependent society, they have all kind of support, but here they have to earn, manage daily tasks such as cooking and cleaning, things they have not experienced before. Then to understand how things work here is hard, starting from learning our driving rules to how to conduct ourselves in interviews.</i>

In light of the literature available the participant's responses have re-affirmed learning and social issues for international student. Total four learning issues and two social issues have been identified from the five interviews. What really matters next is how to address these issues. Accordingly, the next interview question asked participants what recommendations they could suggest to resolve some of the issues which they have identified. Table 2 summarizes the participant's recommendations.

Table 2. Recommendations from Study Participants	
<p>Use blended learning concepts</p> <ul style="list-style-type: none"> • <i>Use blended learning which is partly classroom teaching and partly computer based learning which can be done from home as well.</i> • <i>....make video recordings of tutors covering a topic and make it available online, so students can refer it repeatedly. Obviously we share slides and other material, but when the tutor talks, he brings in reasoning, gives real time examples, and connects the subject to the study outcomes.</i> • <i>When the concept is slightly difficult to grasp such as programming or database, if the visual delivery methods could be developed to suit those entry level students, then they would not find it as difficult as they normally do.</i> • <i>We can try videos or animation for example to explain how packet is built up and how it traverses through the network.</i> 	Learning issues
<p>Conduct review of course content</p> <ul style="list-style-type: none"> • <i>It is good that NZQA have started allowing colleges to build their own courses up to mark with industries..... NZQA is currently going through a large targeted review of qualification, which will definitely help students.</i> • <i>If NZQA provides options of industry based projects during final year of course then it will help students to relate study with the industry criteria.</i> 	Learning issues

<p>Game based learning</p> <ul style="list-style-type: none"> • <i>Using games in teaching is very good idea. Like in gaming we have stages to achieve one after another, we could design learning activities for small business solutions leading towards enterprise solutions. That will keep students motivated and interested.</i> • <i>Using games is an effective way to visualize non tangible components like loops and protocols.</i> • <i>CISCO learning academy use a game called CISCO Aspire. Here you are given a task to connect a computer to a network... and if you find that it doesn't connect because the computer doesn't have network card, then you are given some fiction money. You can then go to a store, where you have to choose the right component from hundreds of components. Then you add your network card to the machine.... so GBL is very effective because they [students] have to identify the components. Students can apply what they have learnt, so its action learning even if it is a game.</i> • <i>GBL is cost effective way in terms of practical implementation and probably avoid damage to our equipment.</i> • <i>GBL will make students interact socially with each other more.</i> 	<p>Learning and Social issues</p>
<p>Provide online information</p> <ul style="list-style-type: none"> • <i>We can tell students about New Zealand's different kind of websites.... so they know what the systems are for house renting, employment rights, weather etc. This would make students more familiar to the local environment.</i> • <i>We can create a website where students can know about New Zealand, know about transportation, where they can go for IRD accounts, job searches, etc.</i> 	<p>Social issues</p>

Table 2 offers us rich insights on tutors' perceptions for resolving these issues. Tutors are the front line staff in direct contact with students, and their recommendations suggest applications using game simulations and visual animations to teach ICT courses, rather than the just using traditional classroom methods. The next section elaborates on these findings and the final section suggests further research to be conducted to answer the second research question.

Discussion

ICT is an applied discipline containing both applied hard and applied soft components. Applied hard components involve various technologies like network controllers, transmission protocols and communication devices, amongst others. Applied soft components involve analytical thinking such as understanding the business domain, using appropriate ICT resources to streamline workflows, and how relevant information can be extracted from business data stores. Further, the applied hard and applied soft components are so interwoven with conceptual thinking and logical skills, that they cannot be studied properly in isolation. Thus both objective representation and subjective thinking share a dynamic relationship, and play a significant role in understanding of the ICT subject discipline. However, the current teaching methods still use traditional approaches, where course content is organized in unit standards, and which have not been updated with emerging new technologies. Teaching content is based on set topics, with tutors having limited time and teaching resources to address the issues they see in their daily teaching.

Theoretical concepts (e.g. object-oriented abstraction, database normalization) require logical thinking, as most concepts are embedded in further applied hard and applied soft topics. These concepts cannot be visualized through traditional classroom teaching, and remain elusive to students who have little or no previous background of IT. This is a challenge for both students and tutors, as they struggle to come to a common understanding; hence games are *“an effective way to visualize non tangible components such as*

loops and protocols". One tutor perceived that international students come from more dependent societies than domestic students, and their subject choice in IT study are generally influenced by their parent's decisions rather than their own interests. And, without interest and prior knowledge, these students struggle to apply learning to practice. "Why I will need this? Why is it important? Why is it used?"

Another reason for lack of motivation was that the current NZQA curriculum for ICT may be outdated and not up to the mark with current industry expectations. As stated by one participant, "It is said that one and half of the year of an IT application is one lifetime of a human". This results in difficulties to apply these concepts to real world scenarios, which has further impact in job interview settings, since interviewees (students) cannot relate to questions asked by the interviewer (prospective employer). Bullen et al. (2007, p. 25) defined capability of IT personnel expected by employer as 'the ability to acquire and apply skills in different setting'.

Also, settling down in a different cultural environment has an impact on students' performance. "The whole course is broken down into multiple unit standards, which cumulatively build on each other for a particular outcome. And if a student misses the first unit because of some reason such as they are new to the country and are learning to cope with the system around them, then this affects their second and third unit standards. They really find it tough and then they probably try to push themselves into an uncomfortable spot and ultimately they give up". Moreover, employers often give more weightage to product centric certification courses, such as Microsoft Certified Solution Expert (MCSE) and Cisco Certified Network Associate (CCNA), rather than their NZQA based ICT qualification.

One of the participant identified 'CISCO Aspire' which is simulation based educational game used by Cisco Learning Network Store (<https://learningnetworkstore.cisco.com>). This game provides the user with a real feel of network establishment using animated objects. Further, the game includes tasks such as buying and selecting components (or tools) from an online fictional store, which are later used to resolve a networking problem by applying some taught curriculum based computer network protocols. By playing instructional games, students can visualize a scenario with real world application of components, which can help to improve understanding on applied hard and applied soft IT issues.

Domestic students have done schooling during their formative years in New Zealand, and are more aware of how the local education systems (e.g., NZQA) work than the international students. The international students' lack of understanding of how the NZQA framework is structured has further associated social and learning challenges. For instance, the ICT curriculum designed by NZQA includes many unit standards with emphasis on soft skills and ethics requirements for working in IT industry of NZ. One such unit standard (US 6882) in Level 5 ICT course is based on resolving computer user problems as help desk support technician role (www.nzqa.govt.nz/nqfdocs/units/doc/6882.doc). The learning outcomes of this unit standard state "Personal communication techniques are employed that allow the users to feel the problem will be resolved to their satisfaction". But, inadequate linguistic capability and cultural diversity form barriers for international students. Even if students have sound technical knowledge, to employ personal communication techniques they must know how to greet customers according to NZ culture. International students are very much affected by their lack of English proficiency skills, which in turn affects other aspects of their social and study life. Linguistic inequality is highlighted in this study as difficulty in understanding accents of local people, students being labeled in a particular stereotypical box, and lack of knowledge of local words (e.g., broly instead of umbrella, dairy instead of local corner shop, etc.).

Finally, another social issue recognized in this study is cultural diversity amongst international students, and fitting in with the local culture. Trauth et al. (2012) have also found stereotypical perceptions among intersectionality of race and gender in regard to IT skills choices and career paths. One participant from our study identified most of the international students come from the mono-cultural environment where they never experience interaction with other cultural groups. Suggestions by participants included providing online resources and other game based extracurricular activities to help improve communication skills. Also education providers could help international students in overcoming the language barrier by conducting basic language courses, such as speaking in the local English jargon style alongside the NZQA recognized ICT courses.

Further Research Direction

This study is currently a work-in-progress, of which the first stage has been completed. Six learning and social issues have been identified. They are (1) Difficulty in transferring theory knowledge to practice, (2) Difficulty in relating course contents to real industry use, (3) Lack of interest in course contents, (4) Difficulty in understanding conceptual topics due to lack of analytical and logical skills, (5) Linguistic inequality, and (6) Cultural diversity. Further, recommendations on resolving these issues from tutors who are the front facing staff have helped to identify the research design for conducting research for the second stage of this study.

The research question posed for the second stage of study is – How can IT tools be used to overcome these challenges and enhance student learning experience? Some pedagogical practices to promote active learning in ICT courses identified in literature involve blended learning, problem based learning and game based learning. The stage one findings in this study too have suggested the use of games as a pedagogical approach to enhance the student learning experience. Games will help simulate virtual environments to depict interactive problem based scenarios where students can explore classroom taught concepts. This will facilitate blended learning where students can translate the taught concepts into virtual environments, and use funny animations of the gaming world. Next, the study proposes to investigate the NZQA (level 5 – level 7) ICT curriculum to identify appropriate games aligned with the course structure. International students studying in a private education provider institute will participate in the game based learning practice. Student and tutor surveys will be conducted after the game intervention strategy to determine the effectiveness of this learning approach for bringing about fun in realizing the learning outcomes for specific unit standards designed by the NZQA authority.

International students are valuable assets as they add value to the host county's economical, educational and cultural growth. Through this study, we aim to provide insight into how education providers can support the international student community and enhance their learning and social experiences in a foreign country. Teachers (tutors) would also benefit from the findings of this study in designing the course delivery structure for international students. While the study provides some helpful insights, it suffers from limitations such as relatively small sample of tutors interviewed. Moreover the study does not address areas that can be generalizable to international students as a whole. Future research could obtain a representative sample from international and domestic students as well as from pure hard and pure soft subjects to give a holistic view of difficulties faced in learning and mastering of the subject curriculum.

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