



*The 21st International Conference
on Computers in Education
18-22 November 2013 Bali, Indonesia*

Doctoral Student Consortia Proceedings of the 21st International Conference on Computers in Education 2013

Editors:

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Supported by:



**Doctoral Student Consortia
Proceedings of the
21st International Conference
on Computers in Education
ICCE 2013**

**November 18, 2013 - November 22, 2013
Bali, Indonesia**



UHAMKA PRESS

2013

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ISBN 978-602-8040-73-0

Publisher:

UHAMKA Press,
Jl Gandaria IV, Kramat Pela,
Kebayoran Baru, Jakarta Selatan,
Indonesia.

Publisher



Jl. Gandaria IV, KramatPela, KebayoranBaru, Jakarta SelatanTelp. (021) 7398898/ext: 112
Website: www.uhamkapress.com, E-mail: uhamkapress@yahoo.co.id

12 November 2013

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ICCE 2013 Theme-Based Doctoral Student Consortia
November 18, 2013 (Monday) to November 22, 2013 (Friday)
Denpasar Bali, Indonesia
Organized by the Asia-Pacific Society for Computers in Education
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PREFACE

This volume contains the Doctoral Student Consortia Proceedings of the 21th International Conference on Computers in Education (ICCE 2013). For this year, the Doctoral Student Consortia (DSC) bring together PhD students working in the broad research areas of computers in education in the following seven sub-themes: Artificial Intelligence in Education/Intelligent Tutoring System and Adaptive Learning(AIED/ITS/AL); Computer-supported Collaborative Learning and Learning Sciences (CSCL/LS); Advanced Learning Technologies, Open Contents, and Standards (ALT/OC/S); Classroom, Ubiquitous, and Mobile Technologies Enhanced Learning (CUMTEL); Digital Game and Digital Toy Enhanced Learning and Society (GTEL&S); Technology Enhanced Language Learning (TELL); and Practice-driven Research, Teacher Professional Development and Policy of ICT in Education (PTP).

The DSC aim to provide an opportunity for a selected number of PhD students to present, discuss and receive feedbacks on their dissertation work-in-progress from a panel of established researchers with expertise in the same research areas. The DSC are meant for students to shape their research methodologies and analysis at the early stage of their PhD research with comments from invited mentors and guidance for future research directions. The DSC also hope to nurture a supportive learning community and promote interactions among young researchers from various institutions and across different countries in the Asia-Pacific region and beyond. It also provides opportunities for theme-based forums to discuss methodological and theoretical issues of central importance. The DSC and the related social events are financially supported by the Asia-Pacific Society for Computers in Education (APSCE).

A group of PhD students (Mohamad ALKHATEEB, NattapolKRITSUTHIKUL, Chia-Jung CHANG, Esther TAN, XueqiZHANG, Rose Ru-WhuiLEE, WaiYingKWOK, Kevin Kai-WingCHAN, Boon See TAN and Mei Lick CHEOK) who were highly recommended by the APSCE Special Interest Group Chairs (SIG) Chairs/Co-Chairs were invited to be the organizers of this prestigious event. This group of senior PhD students is guided by the DSC Chairs (Weiqin CHEN, Hiroaki OGATA, Gautam BISWAS and Chen-Chung LIU). The DSC chairs helped oversee the whole process of organizing the DSC and provided guidance along the way. With a strong sense of responsibility and enthusiasm, this highly dynamic group has been successful in organizing the DSC. It is clear that by entrusting this group of PhD students with the responsibility of organizing this important event and editing the DSC Proceedings, they were able to form a vibrant and supportive research community within a short period of time; which is one of the main goals of the APSCE.

This year 6 papers were finally selected and included in the Proceedings. Each selected paper went through a rigorous blind review by independent peer reviewers to ensure high quality work. We hope that the papers in the proceedings on various research topics will stimulate more research ideas and discussions among the young researchers.

We would like to thank all the invited mentors in making this year's DSC a highly successful event. Finally, we would like to take this opportunity to record our sincerest appreciation to the local organizers in Indonesia for their valuable support and arrangement in organizing the DSC.

On behalf of DSC Co-Chairs

Wei qin CHEN

Hiroaki OGATA

Gautam BISWAS

Chen-Chung LIU

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Adaptive Question Generation Support in Semantic Open Learning Space

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Abstract: This research aims to give learners more content-dependent scaffolding in the self-directed learning of history. Learners use a system to build a concept map containing a chronology. The system is able to generate content dependent support adapted to the learners. To enable this support, we built a semantic open learning space using a natural language online encyclopedia and semantic information using the open linked data. The support is provided by the automatically generated questions and documents. The learners request questions when they need and the system will generate the questions depending on the concept map of the learner. The generated questions aim to leads the learners to new knowledge deepening their understanding.

Keywords: Semantic Open Learning Space, Self-directed Learning, Question Generation, History Learning, Adaptive Learning Support

1. Introduction

When learners are confronted with a self-directed situation, their interests will influence their learning. The advantage of this is that the learners will be more motivated than they are by with classroom learning. Learners can proceed at their own rhythm and take more time to study the concepts in which they are interested. However, the disadvantage is that to study in a self-directed way and reach their learning objective, learners must use their self-regulation skills (Biswas, Roscoe, Jeong and Sulcer, 2009). If these skills are insufficiently developed, the resulting learning will be of a lesser quality than classroom learning, and learners will waste a considerable amount of time trying to extract the information they need, especially in an open learning space where the information is not limited to the studied subject.

Previous research already created systems to overcome this disadvantage such as the Navigation Planning Assistant (Kashihara and Taira 2009), which provides a scaffolding environment used to describe learners' learning plans and state of understanding to prompt their self-regulation in an open learning space. Also using scaffolding is the research of Segedy and al.(2013) which provide Guided Skill Practice in an open environment. The limitation of this system, however, is that its support is '*content independent*' due to the difficulty of working with natural language information on the Web. Of course, we overcome the difficulty when we can prepare learning materials in advance. Teachers, however, cannot regulate the learning materials in principle in self-directed 'exploratory' learning: if teachers specify the learning materials, self-directed learning loses its meaningful advantages. Other notable related research is Kit Build Method (Hirashima, Yamasaki, Fukuda and Funaoi, 2011), which provides a knowledge externalization environment for building a concept map and providing support during the concept map construction. However, in both cases, as the learning material needs to be prepared beforehand, this requires a considerable amount of time even for constructing the closed space of learning. The underlying difficulty of this is also that the system cannot use the semantic information to prepare the domain concept structure of a target field.

Therefore, our approach for building a system able to generate content dependent support in an open learning space is to use semantic information. This is build based on Wikipedia for the natural language information and enhanced by semantic information using open linked data (Heath and Bizer, 2011) to make it a semantic open learning space. This research has two advantages for learning support:

- A) The system can provide content dependent questions in accordance with the learners' interests to deepen their understanding by enhancing their internal self-conversation.
- B) The system can provide suitable documents in accordance with the questions that learners try to answer and highlight the information on which they should focus. Even learners, less skilled at self-regulated learning, can continue motivated learning, since they are released from extracting suitable information from huge amounts of information.

Both for A) and B), one key issue is the adaptability to the learners' interests and learning topics. To realize the above advantages, we adopt ontology and a linked open data technique to eliminate the difficulty of the natural language understanding problem in the history domain. Then, the system can automatically construct respective concept structures of the learning topic in accordance with learners' circumstances.

Regarding A), the problem is that learners cannot always generate good questions (Otero, 2009). The quality of the learning depends on the quality of the questions during this process (Bransford, Brown and Cocking, 1999), it is important to support the learners' question asking and answering activities in the learner's internal self-conversation in self-directed learning. By answering good questions that lead to a deeper understanding, the learner will be motivated to pursue his/her learning. Thus, learners need to be able to generate good questions by themselves. However, learners without support tend to focus on their interests and may not explore others subjects but if the support ignores these interests, the motivation of the learner will be reduced. To make this self-conversation explicit, the system suggests a list of questions depending on the learner's situation represented by the concept map to help the learner's question asking activity.

Regarding B), to support learners without strong self-regulation skills, the system introduces semantic information into the documents. When studying an important number of different concepts, learners may have difficulties in managing new information. It can become difficult to extract the suitable resources to answer the current questions and separate the information in a document into what is already known and what is (ir-)relevant to answer the questions. The system provides documents with a dynamic enhancement based on Wikipedia text with semantic information. These documents can highlight on demand concepts that appear in the text.

2. Overview of the System

The system has three main windows: the question window in Fig. 1(a), the document window in Fig. 1(b), and the concept map window in Fig. 1(c). The question window contains the list of questions generated by the system and the questions already answered by the learner. The document window displays the document answering the selected questions.

In our research, the learner is given the task to build a timeline of the events of the studied period with causal relationships between these events. Our system provides a specific knowledge externalization environment to improve the understanding of chronology depicted as Fig. 1(c). To learn history in a satisfying way, learners need to understand the relations between the events (Stow and Haydn, 2000). They must study the events as a whole, not every event separately. The learner's concept map is designed on this principle. In the center of the concept map in Fig. 1(c) is a timeline of the events ordered by time as usual, but learners also need to add relations between these events as well as other related concepts. All non-event concepts are displayed around the timeline. The motivation for this is to enhance causal understanding of the historical epoch events according to the time series which are backbone of history learning. The surrounding concepts (countries, alliances, commanders, etc) contribute to deepening their causal understanding. The timeline has to contain the important events of the studied period, which are chosen by a teacher from a timeline of all events in the studied period generated by the system to limit the preparation time, but the learner is free to add every event he/she considers relevant. The required events are present in the concept map of the learner at the beginning but they appear in grey until the learner adds them from a document. When using the system, all learners have the same starting point. They are given a document about the main subject of study.

When learning without support in self-directed exploratory learning, learners have to keep their focus on achieving their objective. If they do not, they will lose their way among irrelevant information. It is also possible for learners to stay on topic but study documents of little importance,

like searching detailed information irrelevant to reach the learning objective. While the interests of the learners are important for motivation, they often become a problem in self-directed open learning. Our system aims to give adaptive advice to suit the learner. The interests of the learners influence their concept map, which is used to generate the questions to be answered (Fig. 1(a)).

The learning is divided into two main steps. First, the learners start their learning with a document given by the system in the document window, in Fig. 1(b). While working on a document, they update their concept map, shown in Fig. 1(c), with all concepts and relations they consider interesting. They can add concepts in Fig. 1(b) to the concept map Fig. 1(c) by selecting them in the document, shown in Fig. 1(b). To add relationships between concepts, learners need to select two related concepts in their concept map, shown in Fig. 1(c). Then the system will generate a list of possible types of relation which includes invalid answers: (i) if the system shows one valid answer, they can easily construct their concept maps without enough understanding by choosing the answer the most relevant, and (ii) the system can understand the meaning of each link chosen by learners.

The created concept maps will be different depending on each learner since all learners will perceive the importance of the concepts in accordance with their interests, and we do not regulate the parts used for constructing the concept map to enhance their self-exploratory learning.

Then, when the learner thinks all concepts considered important have been added to the concept map shown in Fig. 1(c), a list of questions from the system appears in the question window, shown Fig. 1(a). The timing of showing the questions when they complete learning is important to become aware of the importance of questioning and answering activities. This list of questions will contain questions that will lead the learner to new relevant information that can deepen his/her understanding. The learner can also simply choose a question from the list without refreshing it. The list of questions is only refreshed when the learner requests it.

3. Current Work

For the learning aspect, the system still doesn't have strong support function intended to control the end of the learning.

For the technical aspect, to make this system possible the system needs to include semantic information. The system uses 3 sources of information: Wikipedia for the natural language and Freebase and DBpedia for the semantic information. Currently, we are working on solving the communication problems between these information sources to be able to use them in the system. The system is still in development phase.

After this has been solved, the next step is the evaluation. It will consist of two groups of

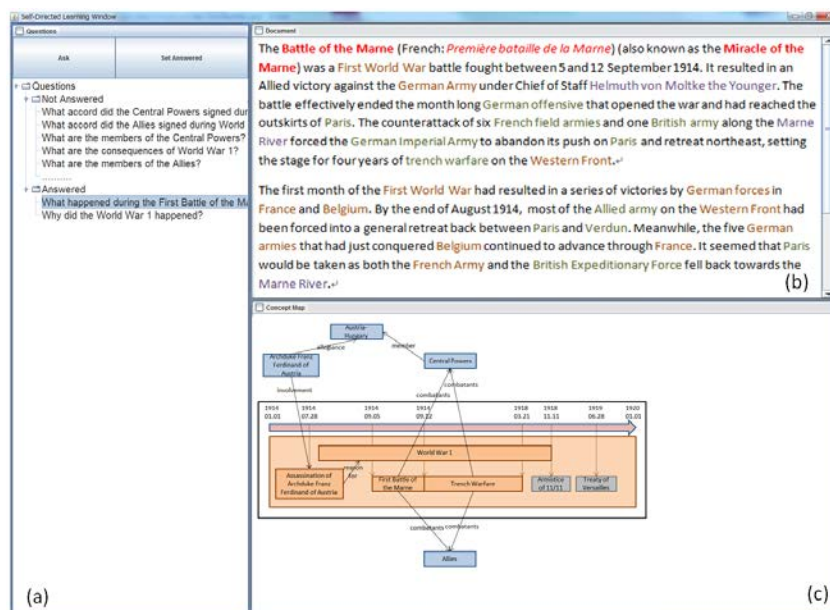


Figure 1. System Image

learners. The first group will use the system, and the second will be a control group. First, the two groups will learn about the same subject, one group will use the system with advice and the other without advice. Both groups will have to create a timeline. Then in a second session, both groups will use the system without the advice. They will have to learn about a second subject by generating questions by themselves. They will have to use as many questions as possible to generate the best timeline that they can. We will evaluate the quality of the timeline by taking into account its complexity and the density of the relations. We also want to evaluate the quality of the questions through the experiments.

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Incorporating Anchored Learning in a C# Intelligent Tutoring System

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Abstract: Learning programming is known to be difficult. One possible reason why students fail programming is related to the fact that traditional learning in the classroom places more emphasis on lecturing the material instead of applying the material to a real application. For some students, this teaching model may not catch their interest. As a result they may not give their best effort to understand the material given. Seeing how the knowledge can be applied to real life problems can increase student interest in learning. As a consequence, this will increase their effort to learn. Anchored learning that applies knowledge to solve real life problems may be the key to improving student performance. In anchored learning, it is necessary to provide resources that can be accessed by the student as they learn. These resources can be provided by creating an Intelligent Tutoring System (ITS) that can support the student when they need help or experience a problem. Unfortunately, there is no ITS developed for the programming domain that has incorporated anchored learning in its teaching system. Having an ITS that supports anchored learning will not only be able to help the student learn programming effectively but will also make the learning process more enjoyable. This research tries to help students learn C# programming using an anchored learning ITS named CSTutor. Role playing is used in CSTutor to present a real world situation where they develop their skills. A knowledge base using First Order Logic is used to represent the student's code and to give feedback and assistance accordingly.

Keywords: Anchored learning, C# programming, Intelligent Tutoring System

1. Introduction

Learning programming is known to be difficult. This situation is shown by the significant number of students in computer science departments who fail programming (Robins, Rountree, & Rountree, 2003; Teague & Roe, 2008). One possible reason why students fail programming is related to the fact that traditional learning in the classroom places more emphasis on lecturing the material, instead of applying the material to a real application. Because of this, some students may lose their interest in learning and not give their best effort to understand the material.

Anchored learning on the other hand, puts the emphasis of learning on solving an interesting real life problem. This learning can increase student interest in learning because they can see how to apply facts and skills to solve the real life problem, instead of just learn the facts and skills themselves. In addition, because the students are presented with a realistic environment, it is likely that they will be able to recall the information more easily when they face another similar problem in the future.

There are some applications that have been built with an anchored learning in their design (Eliot & Woolf, 1996; Schank & Cleary, 1995). However, none of them have been developed to support learning in the programming domain. On the other hand, a number of Intelligent Tutoring Systems (ITSSs) have been developed in the programming domain (Anderson, Corbett, Koedinger, & Pelletier, 1995; Johnson & Soloway, 1985; Mitrovic, 2003; Sykes, 2007; Weragama & Reye, 2013). However, none of these ITSSs have been designed to support anchored learning. Therefore the potency of anchored learning in the programming domain has not been fully explored.

This research tries to help students learn programming by incorporating anchored learning into a programming domain ITS. This ITS, named CSTutor, will be used by students in a programming course in C# at the Queensland University of Technology (QUT) as a supplement to the classroom instruction and is not meant to entirely replace the role of the teacher. CSTutor is being

developed as an integrated tool that runs inside Visual Studio. Through this approach, the students can write their programs in Visual Studio directly and CSTutor will provide assistance and feedback when the students request it.

2. Anchored Learning in CSTutor

Anchored learning is known to motivate students to learn and to enhance their problem solving skills (Shyu, 2000). One reason behind this finding is that the learning process is placed in an authentic context. This context makes the learning become interesting because it reflects the true nature of problems in the real world (Grabinger & Dunlap, 1995).

In anchored learning, the learning or teaching activities should be designed around a story or situation that includes a problem or issue. In this research, role playing is used to let the student “play” as they learn programming. In this role playing, a simulated Head of Development officer appears in the application and offers a programming job to the student if he/she can show his/her ability at writing programs, for some given problems.

The Head of Development also tells student that he/she can use CSTutor – an intelligent tutor that can help the student in writing the program by providing help, and feedback. CSTutor will also be used by the Head of Development to give the problems to be solved by the student.

In the role play, the first goal for the student is to get accepted into the company. This can be achieved by writing several correct programs for the given problems. After the student gets accepted, the next goal that must be achieved by the student is to get promoted to Intermediate Programmer, and later on, to Senior Programmer. The role playing finishes when the student achieves the position of a Senior Programmer. Achieving a certain position in the company is expected to become the student’s higher-level goal when they write their programs. By having a higher-level goal, the work that need to be done becomes more interesting and less burdensome (Schank & Cleary, 1995).

The salary that would be received by the students when they get accepted into a company, and when they get promoted to a higher position, is shown to the students. This is expected to give more encouragement to the students, knowing that they can earn that much money if they really get that kind of job in a company. The salary amount is based on similar real-world programming positions in the year 2012.

In addition, to make the role playing become more realistic, all of the problems given to the students are designed within a particular context. Therefore, the student will never be given a problem with a simple instruction like: “swop the numbers that exist in two variables”, etc. There is always a real life problem behind the instruction.

3. Providing Assistance to the Student as they Learn Programming

Another principle of anchored learning is the existence of resources that can be accessed by the student as they solve each problem. CSTutor provides resources for the students when they have problems while writing their programs. CSTutor gives help and feedback to the students, based on the current state of their program.

In anchored learning, the students should be challenged to think about and work on each problem. Based on this principle, the help and feedback that is given by CSTutor are presented as hints or clues, instead of a direct solution. These hints or clues are presented gradually from more general to more detailed, when the student keep requesting help for the same problem. This encourages the students to think and solve the problem by themselves. Only when the student is completely stuck, will the final answer eventually be given.

The process of generating the help and feedback is started by parsing the student’s program and converting it into facts or actions in a predicate logic form. The actions are used to change some existing facts into another facts. All of these facts are then checked using rules in the knowledge base to see if they can satisfy the goal of the given problem or not. In this approach, several important steps are traced to see if the student program can solve the given problem or not.

For example, let's say that the student is given a task to find the number of real roots that exist for a quadratic equation $ax^2+bx+c = 0$. The number of roots – for example, stored in a variable named *root* – is based on the value of *d* which is defined as: $d = b^2 - 4ac$. In this kind of problem the steps that are traced in CSTutor are:

- The existence of the required variables (*a, b, c, d, root*)
- The input process to variable *a, b, c*
- The calculation to get the value in *d*
- The correctness of the conditional statement to assign the value in *root*
- The display of the variable *root*

CSTutor uses rules to check the correctness of the student code in every step. Using this approach, the students have some flexibility in writing their program. Due to limitations on the length of this paper, it is not possible to explain all of the processes used in CSTutor to analyse the student code. One process that will be explained in here is how CSTutor analyses student code that include conditions (the fourth step of the required steps above)

Figure 1 shows partial code of some possible solutions in the step of assigning the value to variable *root*. The number of roots of a quadratic expression can be determined based on the value of *d*. If $d > 0$ then the quadratic expression will have 2 roots, if $d = 0$ the quadratic expression will have 1 root, and if $d < 0$, the quadratic expression will have no roots.

Version 1.	Version 2.	Version 3.
<pre> if (d < 0) root = 0; else if (d == 0) root = 1; else root = 2; </pre>	<pre> if (d > 0) root = 2; else if (d == 0) root = 1; else root = 0; </pre>	<pre> root = 0; if (d >= 0){ if (d > 0) root = 2; else root = 1 } </pre>

Figure 1. Several possible solutions to assign value to variable *root*

For this, the goal that is specified in CSTutor is shown in **Figure 2**. In this case the value in variable *root* should be the same as:

- 2 if the value in variable *d* is greater than (GT) 0,
- 1 if the value in variable *d* is equal (EQ) 0
- 0 if the value in variable *d* is less than (LT) 0.

<pre> Goal: HasVarValue(varID_d, val_d) HasVarValue(varID_root, 2) ← GT(val_d, 0) HasVarValue(varID_root, 1) ← EQ(val_d, 0) HasVarValue(varID_root, 0) ← LT(val_d, 0) </pre>
--

Figure 2.The goal specification to find the roots of a quadratic expression

The first process performed in CSTutor is to parse the student's code and store it as facts or actions. For code that contains *if-else* statement, all the implicit conditions will be made explicit. This implicit condition can occur because of an *else* part, or because of a nested *if*. For example, the code in version 3 of **Figure 1** will be converted into the following predicates. The conditions shown in bold are the explicit conditions that occur from the process.

```

HasVarValue(varID_root, 2) ← GE(val_d, 0) ^ GT(val_d, 0)
HasVarValue(varID_root, 1) ← GE(val_d, 0) ^ NGT(val_d, 0)
HasVarValue(varID_root, 0) ← NGE(val_d, 0)

```

These conditions are then simplified to become:

```

HasVarValue(varID_root, 2) ← GT(val_d, 0)

```

HasVarValue(varID_root, 1) ← EQ(val_d, 0)
HasVarValue(varID_root, 0) ← LT(val_d, 0)

The results from this parsing process are then checked using rules in knowledge base to see if the predicates from the student code can satisfy the problem's goal or not. Using these rules, CSTutor can recognize if two conditions are logically the same even though they were written differently. For example the condition LE(1, val_d) can be recognized to be logically the same as GT(val_d, 0) for an integer number. By using these kinds of rules, the student does not have to write code in exactly the format as the conditions specified in the goal.

4. Expected Contributions of this Research

This research aims to help students learn C# programming by incorporating the concept of anchored learning in an Intelligent Tutoring System. By having an ITS as a private tutor, the students can have as much assistance as they need. In addition, the use of anchored learning in CSTutor is expected to make the learning process more enjoyable and less burdensome for the students.

A knowledge base is used in CSTutor to check whether the student's program code is correct. And if incorrect, then where it is incorrect. This knowledge base makes it possible to check a variety of student code. The knowledge base is used to give feedback and assistance to student.

This research is expected to give contribution in revealing the effectiveness of an ITS that incorporates anchored learning to help students learn programming. An evaluation will be performed to measure this effectiveness. Another evaluation will be performed to see whether the students regard the anchored learning approach as making the learning more interesting, or not. If the results are positive, these findings will enable educators to consider using this approach when teaching programming.

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Teacher's Attitudes towards Informational Technology (IT) Immersion in Singapore's Childcare Classrooms

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Abstract: Technology immersions are widely adopted in Singapore's childcare centers. In the last five years, as the flourishing of touch screens such as tablet computers, interactive whiteboards, smart phones, and smart TVs, up-to-date IT devices have become increasingly accessible by young children. In Singapore, the Ministry of Education (MOE) has highlighted the use of technology to support and enhance Early Childhood Education (ECE). Despite up-to-date IT devices' effectiveness and popularity in ECE, to our knowledge, there has been a lack of researches on examining how childcare teachers think. To address this timely issue, this study adopted a quantitative correlational research design to assess childcare teachers' attitudes on integrating IT in ECE. The data are to be collected by adopting and modifying from the Computer Attitude Scale (CAS), developed by Selwyn (1997). The sample of this study is Singapore childcare teachers who volunteer to fill the questionnaires. The data will be analyzed by conducting descriptive statistics and inference statistics in order to determine the influence of age, working experience, total training hours received, educators' qualifications, up-to-date technologies used at home, and teaching median (English/Mandarin) on teachers' attitudes.

Keywords: Informational Technology (IT), Early Childhood Education (ECE), technology immersion, young children, teacher's attitude

1. Introduction

Information Technology (IT) devices have been developed greatly in recent decades. Nowadays, both ECE educators and young children are technophiles. Undoubtedly, IT devices become more and more popular to be used to support young children's development and learning. And the educators believe they can handle various IT devices at the same time (Herman, 2012). Beside old IT devices, such as computers and TVs, there are new IT devices, such as interactive white boards, smart phones, smart TVs, and touch pads (Plowman, Stevenson, McPake, Stephen, & Adey, 2011; Wang, Kinzie, McGuire, & Pan, 2010). Meanwhile, the new applications of these old and new IT devices rising dramatically which make young children spend more hours daily on the devices (Herman, 2012).

In Singapore, almost all the childcare centers are equipped by IT devices in their settings. In 2008, Ministry of Social and Family Development (MSF) surveyed 229 Singapore childcare centers and headquarter operators, 84% of them had positive attitudes on integrating IT in young children's learning (Ong, 2010). Since 2008, the flourishing of new IT devices and the upgraded applications have become increasingly accessible by young children. Singapore young children spend all day in childcare from 7am in the morning until 7pm in the evening. Their experiences within the childcare classrooms play a pivotal role in their learning journey. And childcare teachers have very important responsibilities to provide young children with an optimal environment. It is clear that childcare teachers have to constantly re-think, evaluate and re-shape their daily practices for effective IT integration. Moreover, there is a need to consider how childcare teachers think, especially their thoughts on integrating up-to-date IT in their daily practices. As IT and teachers' roles have become important in ECE, the purpose of this study is to examine the childcare teachers' attitudes towards technology immersion in ECE.

2. Review of the Literature

2.1 Definition

Based on literature, IT was defined as “anything which allows us to get information, to communicate with each other, or to have an effect on the environment using electronic or digital equipment”(Saude et al., 2005). Technology immersion is using IT as learning media to facilitate learning and development. The attitude was defined by three characteristics “the notion that attitude is learned, that it predisposes action, and that such actions are consistently favorable or unfavorable toward the objects”(Fishbein & Ajzen, 1975).

2.2 Theoretical Framework

This study is based on the theoretical framework which illustrated young children’s learning at three layers (Figure 1). The micro layer consists of children’s centeredness and childcare teachers’ power (Tzuo & Chen, 2011; Tzuo, Yang, & Wright, 2011). Young children’s needs drives childcare teachers’ intention to integrate IT in their daily practice. The meso-layer is reconceptualism. Facilitating conditions are embedded in this layer. These conditions are teacher’s age, working experience, training, qualifications, up-to-date technologies used at home, and teaching median (English/Mandarin). The macro layer extended the viewpoints to social dynamics. The flourishing new IT devices in community influence teacher’s attitudes towards IT. All three layers are related and informed by Vygotsky’s foundation theories. The implications of Vygotsky’s socio-cultural-historical theories of learning with IT based on literature include language, scientific concepts, spontaneous concepts, and the zone of proximal development(Charnitski & Harvey, 1999). In his book “Mind of Society”, Vygotsky found that young children’s interactions with other people and environments promote their development(Vygotsky, 1978).

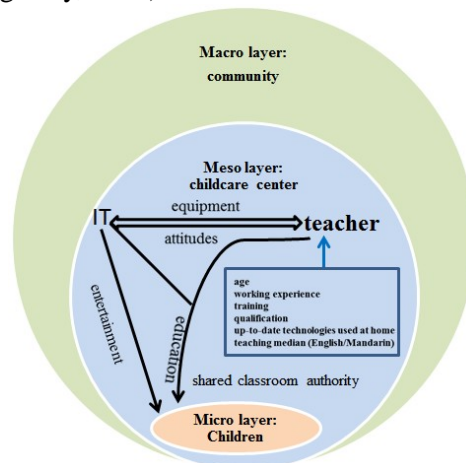


Figure 1. Theoretical framework

2.3 Childcare Teachers’ IT Attitudes

Childcare teachers’ attitudes towards IT immersion in ECE are worth exploring. Because their choice of resources made available to young children influence young children’s learning experience(Lynch, 2011).

The literature indicated that ECE teachers’ attitudes can be influenced by several factors. A survey of 297 in-service U.S. ECE teachers’ attitudes towards IT has indicate that their attitudes are varied with working experience, teacher’s type, IT used at home, and total hour of training received(Chen & Chang, 2006). However, a survey of 213 freshman and senior pre-service ECE teachers by Yilmaz&Alici(2011) found no significant relationship between age, working experience, IT devices used at home and attitudes. On the other hand, another survey of 238 in-service teachers

has presented conflicting results. There was a negative correlation between working experience and teachers' attitudes (Joshia, Pana, Murakamib, & Narayananc, 2010). When the impacts of training being examined, ECE teachers have very strong commitments. A mixed method study of 40 Botswana in-service teachers declared they need training integrate both IT and ECE skills (Bose, 2009). In Europe, a survey of 549 ECE teachers, more than 50% of them claimed they need IT training courses to facilitate their daily practice (Saude, et al., 2005). This is consistent with another Greece research which investigated the attitudes of 278 in-service ECE teachers on the prospect of integrated IT into childcare level, the results indicated that attitudes were shaped by the in-service training (Tsitouridou & Vryzas, 2004). And a study of 82 in-service U.S. ECE teachers showed that formal training is positively related to the respondents' attitudes towards IT (Sexton, King, Aldridge, & Goodstadt-Killoran, 1999). As suggested by Lynch (2011), childcare teachers' attitudes related with their practical experience rather than theoretical knowledge. And it is the attitude guide childcare teachers' daily practice. With different attitudes of IT, childcare teachers vary on how to teach.

Overall, there is increasing number of researches about integrating IT in ECE in other countries, but limited parallel research in Singapore's local context. To address this gap, this study is to examine childcare teachers' attitudes towards IT with following research questions.

1. What are teachers' attitudes of integrating up-to-date IT in their daily practice?
2. Is there a significant relationship between childcare teachers' attitudes and the independent variables? The independent variables are age, working experience, total training hours received, qualifications, up-to-date technologies used at home, and teaching median (English/Mandarin).

3. Methodology

3.1 Research Design

This study was designed as a quantitative correlational research design. It was conducted to examine the relationships between childcare teachers' demographic characteristics, IT background, and attitudes towards integrated up-to-date IT into daily practice. Based on Gravetter & Wallnau (2008), if there is a perfect positive correlation, the Pearson's r would have a value around +1.0 and if there is a perfect negative correlation, the Pearson's r would have a value around -1.0, and if there is no correlation between the variables, the Pearson's r would be around zero. The correlation cannot demonstrate a causal relationship. So this study uses correlation to explain the childcare teachers' attitudes, to support the theoretical framework. The hypotheses are: There is a positive correlation between each independent variable and attitudes of integrating up-to-date IT.

3.2 Procedure and Instruments

The questionnaires will be administered at the beginning of the 2014 academic year for duration of one month. The context of the study is set in childcare center in Singapore. Based on Creswell (2012), snowball sample is adopted. Participants of this study are comprised of childcare teachers in Singapore. After a brief introduction to the principle, the questionnaires are distributed to teachers by principle. Considering the validity of the study, the target sample size is 200 in-service childcare teachers. They participate in this study on a voluntary basis. Participants are told that they could withdraw their participation during or after data collection by informing the researcher within one week after the data collection. Participants will respond to the revised CAS using a five-point Likert-scale ranged from strongly disagree (1), disagree (2), neutral (3), agree (4), to strongly agree (5). The revised CAS consists of 21 items. The items focus on affectivity, perceived usefulness, perceived control, and behavioral intention. The scores from the items on each section are aggregated to provide individual scores on each part. In this study, the negative items are reversed coded in order that meaningful analyses at the sub-scale level can be conducted. The CAS is an instrument with high reliability.86 and.90 (Sexton, et al., 1999; Teo, 2008).

3.3 Data Analysis

SPSS 19.0 for Windows analysis the raw data. The descriptive statistics are used to give a straightforward presentation of teachers' attitudes. They are frequency distribution, central tendency (mean, median, and mode). With inferential statistics, ANOVA (Analysis of Variance) is conducted to examine the multivariate normality and equality of variance. Correlation analysis is used to test whether there is a significant correlation. With Excel, set up the columns for Participants (e.g. in-service teacher), Variable 1 (qualification), and Variable 2 (e.g. attitudes towards integrate ICT). Follow by type in the data into these three columns. Then, select the "Pearson" with highlight the data, charts, graphs and scatter plots will be generated by Excel.

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Predictors of Teacher Trainees' Satisfaction in Using the Learning Management System in Teacher Training Institutes

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Abstract: E-learning is increasingly becoming an important delivery approach in teacher training institutes. Like with other innovations, there are factors that will affect users' behavioural intention to accept and adopt it. The purpose of this study is to test and validate a proposed model in predicting teacher trainees' satisfaction of the learning management system at the teacher training institutes in Malaysia. In measuring the success of an e-learning approach, it is best measured in terms of end-user satisfaction in using a system. Thus, their future behaviours can be predicted. It examines relationships among variables associated with factors that influence satisfaction. Data will be collected from 400 participants using a survey questionnaire. Practical interventions for teacher trainees will be suggested to assist individuals and organisations towards increasing technology usage. The research yields a theoretical framework that outlines the predictive potential of the key factors in explaining satisfaction which then leads to explaining technology acceptance and usage among the trainees. These factors can and should be considered when developing Continuous Professional Development trainings and intervention programmes.

Keywords: Information system, end-user satisfaction, learning management system, teacher training institutes

1. Introduction

Improving and empowering teacher and school leadership will be given top priority under the Malaysian Education Blueprint 2012-2025 (Star, Sept 19:2012). The Blueprint will open new horizons for the country's future education. Deputy Prime Minister Tan Sri Muhyiddin Yassin (Star, Sept 19:2012) shared that the ministry would give extra focus in improving teaching professionalism, learning skills, knowledge and quality teaching as part of the Malaysian Education Blueprint 2013-2025. The transformation reflects the seriousness of the government of taking Malaysian education into a system of high international quality and standard. The first key area of transformation is the empowerment of teachers.

One critical area where we can focus our attention on in empowering teachers is in the use of technology. One study showed that schools in which teachers had technology training and used computers to teach, enjoyed high attendance rate and high teacher morale (Schacter, 1999). It was also found that students of teachers who had received training in computer technology, outperformed students whose teachers had no educational technology training. Increasing technology use means responding to students' diverse needs and providing engaging and meaningful learning experiences in schools. To be able to do this, it has to start with the teachers' education. We have got to get teachers to start teaching according to how their students' learn best. Technology offers a variety of instructional options to teachers. It motivates students as they are immersed in electronic devices in their everyday lives. However, many of our existing educators do not have the same understanding of and ease with using technology that is part of the lives of professionals in other sectors. Concerns about this lack of technology use have led to more efforts and discussions as to how more opportunities can be provided for the trainee teachers to use technology throughout their preparation programme. In US, the Department of Education's Preparing Tomorrow's Teachers to use Technology

programme provided over \$750 million to projects focusing on new methods in preparing future teachers to effectively integrate technology into their teaching (Lawless & Pellegrino, 2007). Across the world, education and government leaders are promoting the need for better preparation of teachers to integrate technology and extensive funds have been expanded to support these efforts (OECD, 2005).

Predictors of end-user satisfaction will be a useful tool to access the likelihood of success for any new technology introduction. It helps us to understand the drivers of acceptance thus enable us to proactively design interventions targeted at population of users that may be less inclined to adopt and use new innovations. Research into the factors that correlate to the adoption of e-learning could shed light into what the teacher training management needs to do to encourage participation and usage. It is assumed that this could then result in increased acceptance and usage among the teacher population. The final result of this could see teacher training institutes in Malaysia reaping the benefits of e-learning. The presence of a new innovation in education though despite its promises of greater benefits, will not automatically translate into actual usage unless teachers' satisfaction towards that innovation is fulfilled. This paves the way to this study where there is a need to search for deeper understanding as to what are the main incentives and barriers to the acceptance and use of e-learning. To date there are limited studies on predictors of satisfaction in e-learning among the trainee teachers in the Malaysian Teacher Training Institutes.

This study will extend DeLone and McLean IS Success Model as a theory that will not just predict satisfaction but also innovation acceptance among the trainee teachers in the Malaysian Teacher Training Institutes. The rationale is to promote the use of e-learning in teacher training institutes in this country by understanding what affects their satisfaction when they use the learning management system provided in their institutes. Actions and intervention plans can be then made to ensure a high level of satisfaction is maintained in order to encourage consistent and increased usage of the system. The research will also contribute to the existing theories; technology acceptance model (TAM) and DeLone and McLean IS success model in teacher education and developing country setting. Thus, the main objective of the study is to predict factors that influence satisfaction in e-learning. The study will be carried out to achieve the following:

To develop a model to predict factors that influence end-user satisfaction in the use of the learning management system among trainee teachers in the institutes.

2. Review of the Literature

2.1 Learning Management System (LMS)

The learning management system is an information technology used by instructors to build and maintain course websites. It provides a range of administrative and pedagogic services related to formal education settings. This includes posting course content, updating events and managing interactive communication with students via messages, forums and surveys (OECD, 2005). Academic institutions have invested heavily in LMS implementation to support online teaching. Therefore, to justify the heavy investment in LMS technology, it is important to study factors that affect students' satisfaction when they are using the LMS (DeLone and McLean, 2003). LMS has been said to be one of the prominent features of e-learning development in tertiary education worldwide. Now we need to ask ourselves if e-learning improve the quality of education. Review of past literature will give a resounding yes as the answer. Teacher Training Institutes should now be looking for ways to mainstream e-learning and maximize its impact in the classroom. Though basic infrastructure still needs further development in Malaysia, the problem still lies with the fact that students and teachers do not use them enough. To date, successful practices and valuable experiences in isolated cases across the country have limited impact, visibility and recognition.

2.2 Theories related to the Study

Theories that form the basis of this study are DeLone and McLean (2003) information system success model and the technology acceptance model by Davis (1989). TAM model is developed by Davis and

it is an adaptation of the Theory of Reasoned Action and the Theory of Planned Behaviour. DeLone and McLean's IS success model provides a good framework to identify and develop different measures for several important dimensions. It is used in the field of human-centered technology and usability studies to understand different aspects of IS success. As such it could provide a practical way to evaluate for example what leads to satisfaction among users or what problem does the usability of the system create to users.

User satisfaction is viewed as the attitude that a user has toward an information system. User satisfaction is primarily measured by various subsets of beliefs about either the system, information or other related characteristics. It describes system and information design attributes; a useful diagnostic for system design but a weak predictor of system usage. This is because beliefs and attitudes about objects are poor predictors of behaviours (Azjen and Fishbein, 1980). For a belief or attitude to be directly predictive of behavior, it needs to be consistent in time, target and context with the behavior. My satisfaction will not directly impact my usage but it will impact my beliefs which will then affect my attitude and shape my behavioural beliefs about using the system. Beliefs will shape attitude toward use and finally usage behavior.

I have listed 12 antecedents (refer Figure 1) to system, information and user quality. These predictor factors are derived from a decomposition and integration of factors identified in the user satisfaction literature. Each factor reflects perceptions of the system itself and the way it delivers information. We assert that beliefs one has toward the information, system and user quality will shape attitude towards the LMS satisfaction respectively. Information, system and user satisfaction in this study represent behavioural-based attitudes that serve as external variables which shape behavioural beliefs. The behavioural beliefs will then directly influence attitude toward use and ultimately usage. This study will only be looking at factors that influence satisfaction towards the use of LMS. Past studies have shown that high level of satisfaction will lead to favourable behavioural beliefs, and also favourable behavioural attitude and ultimately using the information system provided.

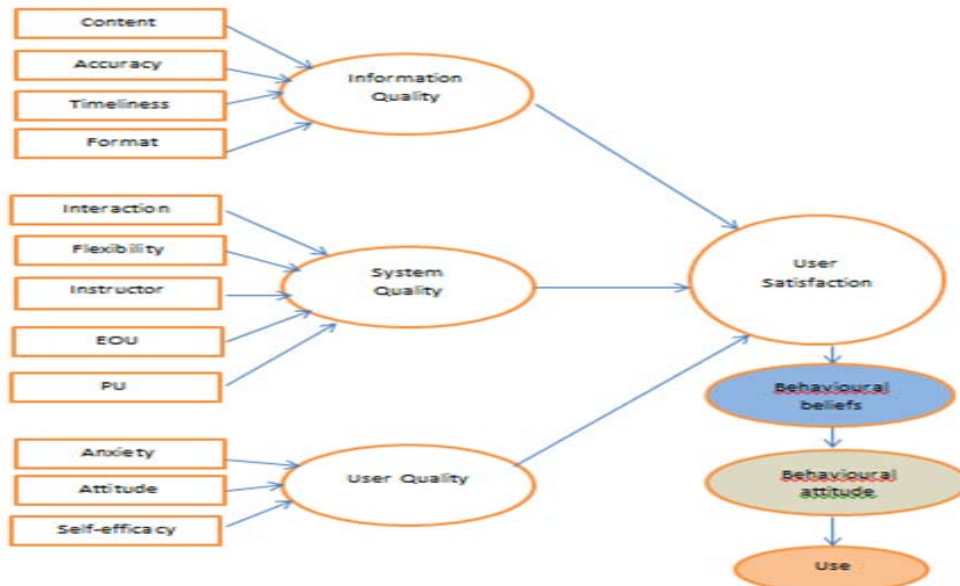


Figure 1: The Proposed Research Model

3. Methodology

The aim of this study is to determine factors that influenced trainee teachers' satisfaction level when using the LMS. The predictor factors to be investigated are information quality, system quality and user quality. As for information quality, a number of aspects will be studied. They include content, accuracy, timeliness and format. The system quality will be looking at interaction, flexibility, instructor, ease of use, and perceived usefulness. Finally, user quality will only be looking at anxiety, attitude, and self-efficacy.

This study will be based on a quantitative approach as the researcher aims to test the hypotheses of the proposed research model. Quantitative descriptive study involves accumulation of data to respond to questions related to the current status of the subject of the investigation (Bryman, 2008). This will be a descriptive survey study. The accessible population of investigation in this study includes all the teacher training institutes in Peninsular Malaysia. However, only institutes which fall in the central and southern regions and have established their learning management system for at least more than five years will be considered for the study. This is to ensure sufficient reliable information can be gathered from a mature implementation of the learning management system. Hair et. al. (2006) recommended at least 200 respondents for studies which are using SEM for valid results. Increasing respondents' size by up to 50% is recommended by Salkind (2005) in order to overcome sampling error. Guy and Airasian (2003) suggested using larger samples than minimum in various situations. Hence, a larger sample size of at least 400 was appropriate to be drawn for causality reasons. The number of gender among trainees will be according to the proportion in the chosen population.

Questionnaire development will be patterned after the process proposed by Moore and Benbasat (1991). The process starts off by compiling questions from a number of validated instruments (Doll and Torkzadeh, 1988; Arbaugh, 2000; Sun et al., 2008) in measuring each construct. Next the instrument will be reviewed by three academics and practitioners involved in delivering e-learning courses. This will result in some items being removed, re-worded or re-sorted. The resulting survey will be then pilot tested using respondents from the teacher training institutes. Based on the result of the pilot sample, further modifications will be made to the survey before the actual data collection is carried out.

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Exploring Pedagogical Synergy of Peer Assessment and Social Learning Platform for Fostering English Grammar Learning

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Abstract: In view of the trends toward the pedagogical goals and the technological integration for English grammar learning in the twenty-first century, this study aims to explore the pedagogical synergy of peer assessment and social learning platform for supporting English as Second Language (ESL) learners at the elementary school level to develop English grammatical knowledge. A technology-mediated pedagogy has been designed to combine the element of guided inquiry with the use of topic-specific e-learning websites and the element of peer assessment with the use of social learning platform for supporting elementary ESL learners to develop knowledge about English basic tenses through English writing tasks. An empirical research which combines qualitative and quantitative methods is planned to investigate the impact of two settings of the designed technology-mediated pedagogy in a real classroom environment. Two classes of Grade 4 ESL learners will be invited to learn the three target grammatical topics under the two settings during a three-week trial teaching period, respectively. The empirical research will conduct attainment tests, content analysis of student artifacts, questionnaire surveys and semi-structured focus group discussions to investigate the impact of the designed technology-mediated pedagogy on the achievements, processes and perceptions of learners in the development of English grammatical knowledge through peer assessment of writing products. This study will contribute to pedagogical innovations in the use of social learning technology for effective development of high-level linguistic knowledge among ESL learners in elementary school education.

Keywords: English, elementary school, grammar, peer assessment, social learning platform

1. Research Motivation

School education in the twenty-first century puts a growing emphasis of learner-centered learning through the meaningful integration of Information and Communication Technology (ICT) with practical pedagogies for classroom learning and teaching across different subject areas (Chan, 2010; Säljö, 2010). There is a growing use of free digital resources, ranging from static PowerPoint slides to interactive subject-related websites, available on the Internet for subject teaching and learning in school education (Halse & Mallinson, 2009; Solomon & Schrum, 2007). In language subject area, there is a research advocacy of investigation into the impact of using ICT in language classrooms in the elementary school sector, especially on the development of high-level linguistic knowledge about syntactic rules, because language learning in elementary school is critical for young learners to build foundation for the long-term development of linguistic intelligence (Andrews, Freeman, Hou, McGuinn, Robinson, & Zhu, 2007; Richards, 2009).

In Hong Kong elementary school sector, there is a decade-long emphasis on the pedagogical integration of ICT into the delivery of English as Second Language (ESL) curriculum, as English language is not the native language of the majority of student population. The use of ICT is considered helpful to provide young ESL learners in local elementary schools with various types of affordances for effective learning of the very important but very difficult components in English

language subject, such as grammatical knowledge of tense and agreement (Hegelheimer & Fisher, 2006; Zhao & Lai, 2008).

As the reciprocal influence between learners' performance of writing tasks and their development of grammatical knowledge is well established (Hegelheimer & Fisher, 2006; Yin, Sims, & Cothran, 2012), the ESL research community in recent years devotes their effort to continuously research into the use of different types of digital resources for supporting learners to enhance the processes and outcomes of English grammar learning through everyday English writing tasks (Andrews et al., 2007; Hegelheimer & Fisher, 2006). In this vein, social learning platforms such as Wikispaces are increasingly adopted in elementary school education over the world. On the other hand, peer assessment is long advocated to be a potential pedagogical approach for ESL writing classrooms. The research delineated in this paper, therefore, is motivated to explore a technology-mediated pedagogy which integrates the approach of peer assessment and the technology of social learning platform for English grammar learning in elementary ESL writing classrooms.

2. Research Issue

This study aims to explore the pedagogical synergy of peer assessment and social learning platform for supporting ESL learners at the elementary school level to develop English grammatical knowledge through everyday English writing classes.

Peer assessment, which is premised on the social learning theory, refers to the process that learners use criteria to make judgments and give feedback on the learning products of their peers. The rationale behind this pedagogical approach is that learners take an active role in constructing target domain knowledge and managing their learning progress through timely interaction with peers to exchange ideas and collect feedback on their learning products (Roberts, 2006; Topping, 2005). In the field of ESL education, the pedagogy of peer assessment is often implemented in writing lessons across different grades with a great flexibility for classroom implementation, in terms of group size, member ability, proportion between peer feedback provision and teacher feedback provision, etc. Learners in peer assessment activities are usually asked to review and comment different aspects of the writings produced by group members, such as the language use and content scope. For the peer assessment activities for young learners, researchers suggest that teacher feedback provision might follow learners' feedback provision for the purposes of learning guidance (Shih, 2011; Xiao & Lucking, 2008).

Social learning platforms, which are emerging web-based tools specific for educational use, refer to websites with interface layouts and communication functions similar to those in social networking sites, but with user groups and interaction contexts limited for designated communities within schools for pedagogical purposes (Ghamrawi & Shal, 2012; Solomon & Schrum, 2007). These platforms provide affordances that support learners across different grades to conveniently share and store multimedia resources, and easily exchange and track discussion ideas within restricted groups of teachers and learners for learning purposes anytime, anywhere. They are therefore considered potential to help learners to achieve active, constructive and interactive learning when appropriate subject topics and pedagogical designs are selected in classroom teaching (Halse & Mallinson, 2009; Säljö, 2010).

Based on the literature review on the pedagogy of peer assessment and the technology of social learning platforms for educational purposes, a technology-mediated pedagogy is conceptualized with a goal of forwarding the use of ICT for fostering English grammar learning among elementary ESL learners. ESL teachers over the world are found to mainly adopt two pedagogical approaches to English grammar teaching — the form-focused approach which focuses on inculcating grammatical knowledge through tasks on grammar-rule manipulations; and the communicative approach which focuses on applying grammatical knowledge in classroom interactions through authentic learning tasks. Therefore, the design of the target pedagogy takes the growing advocacy in English grammar learning and teaching — a strategic combination of inquiry learning under the form-focused approach and collaborative learning under the communicative approach — into consideration.

The designed technology-mediated pedagogy integrates the approach of peer assessment and the use of social learning platform. As elementary school teachers in Hong Kong habitually use free online resources for subject teaching and learning, the designed technology-mediated pedagogy will

focus on the use of free-of-charge topic-specific e-learning websites and social learning platform available on the Internet for the trial teaching. On the one hand, the designed technology-mediated pedagogy includes guided-inquiry activities which ask learners to browse topic-specific e-learning websites for generalizing knowledge about grammatical rules and then recording and sharing the learned grammatical knowledge on the selected social learning platform. On the other hand, it includes theme-based short writing tasks followed by peer assessment tasks on the selected social learning platform to engage learners in applying, reflecting on and consolidating the learned grammatical knowledge. The peer assessment task is designed to have two variations for a flexible implementation according to the learning needs of the target young learners: one variation focuses on peer review only, and the other one includes peer review coupled with teacher feedback.

3. Research Plan

This study will be an empirical research which adopts both quantitative and qualitative methods to investigate the impact of the designed technology-mediated pedagogy in a real classroom environment.

An elementary school that has rich experience in ICT in education will be purposefully sampled in the author's home city as the partner school. Two classes of Grade 4 students, each consisting of around 30 students with similar learning ability, will be selected from the partner school for a three-week trial teaching period. This amounts around nine 40-minute lessons. The topic of the trial teaching period will focus on the three basic tenses in English language system, namely present simple tense, past simple tense and future simple tense. Each trial teaching week will cover the teaching of one basic tense. The English teachers of the two sampled classes will take charge of the classroom teaching throughout the whole trial teaching period. The two sampled classes will be randomly assigned to one of the following two settings for learning English grammar in pairs in every trial teaching lesson:

- Setting 1: Guided inquiry with selected websites >>> Short writing task and peer assessment (peer review only)
- Setting 2: Guided inquiry with selected websites >>> Short writing task and peer assessment (peer review coupled with teacher feedback)

Three research questions are made for the empirical research:

- (i) What are the achievements of elementary ESL learners in English grammar learning under the designed technology-mediated pedagogy?
- (ii) What are the patterns among elementary ESL learners in peer assessment involving the use of social learning platform for English grammar learning under the designed technology-mediated pedagogy?
- (iii) What are the perceptions of elementary ESL learners in English grammar learning under the designed technology-mediated pedagogy?

4. Research Methods

Four methods will be adopted in the empirical research to investigate the effect of the designed technology-mediated pedagogy. First, all students will sit for identical pre-test and post-test (Creswell, 2012) before and after each of the three trial teaching weeks, respectively. The test papers will be adapted from the established instrument adopted by Yin et al. (2012) to include a series of questions that assesses students' knowledge of the target English grammatical topics. Second, a content analysis (Krippendorff, 2013) of student artifacts will be conducted to identify the patterns among students in each of the two settings when they perform peer assessment involving the use of social learning platforms during the whole trial teaching period. The function of the selected social learning platform for tracking posts will be used to keep records of every input by each learner during peer discussions. These records will be processed by content analysis to contextualize learners' types of peer feedback and strategies of feedback provision.

Third, a questionnaire survey (Creswell, 2012) will be conducted at the end of the whole trial teaching period. All students from the two settings will be asked to complete a self-administered

questionnaire to indicate their perceptions of the implementation of the designed technology-mediated pedagogy for English grammar learning. Fourth, one-fifth of the students in each of the two settings will be randomly selected for the semi-structured focus group discussions (Creswell, 2012) to further investigate their perceptions of the implementation of the designed technology-mediated pedagogy. The selected students will be asked to describe the changes in their process, motivation and achievement in the learning of English grammar through the lessons that implement the designed technology-mediated pedagogy.

5. Research Contribution

For the elementary school sector in most Asian cities such as Hong Kong wherein English language is not the native language of the majority of student population, there is a genuine need to empower local ESL teachers to plan and implement effective and efficient methods for the pedagogical use of ICT in English grammar learning and teaching. The learning tasks in English writing lessons always require learners to demonstrate their grammatical knowledge. This in turn creates opportunities for ESL teachers to make pedagogical innovations in the use of ICT for fostering learners' development of English grammatical knowledge through the process of English writing.

This study sets to contribute to the field of ICT in ESL education in two aspects. The research approach of this study will lead the evidence-based research outcomes, which not only give ESL teachers recommendations on the advancement of English grammar learning in ESL writing classrooms; but also support ESL teachers to gain insights into further effort in the innovative design of technology-mediated pedagogies for English grammar learning in elementary school education.

The empirical research in this study is going to be conducted in a real classroom environment. The research results obtained will help to inform the establishment of a pedagogically sound practice that exploits the potentials of peer assessment and social learning platforms for maximizing the learning effectiveness among elementary ESL learners in English grammar learning.

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