FROM THE DIGITAL TO AUTHENTIC CLASSROOM: A STUDY OF USING AN ONLINE SIMULATION FOR TEACHER EDUCATION

by

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Abstract

The recent increase in critiques of the quality of education offered by schools and universities all over the world has drawn attention to the importance of teachers' preparation before starting teaching in classroom settings. The purpose of this study is to address the critiques and challenges of current teacher education programs, examine the ways by which simulations can be effective in enhancing the quality of education for pre-service teachers, and evaluate "simSchool" as an online classroom simulation for teacher education.

According to standards of evaluating instructional tools and simulations, an evaluative survey was designed and completed by the student teacher participants following practicing and working with simSchool classroom simulation. The qualitative and quantitative data collected from the survey and the self-report results from the simlation were then analyzed using Microsoft Excel and SPSS for Windows, and the final results were reported through descriptive themes and statistical tables.

Keywords: teacher education; online simulation; pre-service teachers; instructional tools; computer; educational technology

Dedication

To my family especially my parents who have supported me in every step of the way throughout my studies.

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1 Thesis Overview

The concept of this thesis was sparked by the simSchool simulation program (www.simschool.org) carried out by the *Preparing Tomorrow's Teachers to Teach with Technology (PT3)* program of the U.S. Department of Education (Zibit & Gibson, 2005).

My research focused on studying and evaluating the effectiveness of working with the simSchool simulation as an educational tool for enhancing pre-service teachers' education.

simSchool is a classroom simulation program, "Just as a flight-simulator immerses a player in the complexities of flying a plane, simSchool immerses novice teachers in some of the complexities of teaching 7th-12th grade students who possess a variety of different learning characteristics and personalities." (Zibit & Gibson, 2005, p.1).

Simulations as learning environments have a long history of use in education and training and may have a role in addressing the challenges of teacher education. Recent research shows that "over the past decade simulations have become increasingly popular for creating realistic digital environments that closely replicate the world and the workplace" (Ferry, et al., 2004, p.295). This growth has resulted in a recent interest in examining the potential of using simulation in enhancing the quality of education for pre-service teachers.

My research study involved evaluating simSchool as an online educational simulation for pre-service teachers. I was interested in more than simply examining the simSchool simulation as an educational software; I wanted to evaluate the effectiveness of using simSchool simulation from different perspectives as an instructional tool for improving pre-service teachers' education. For this purpose, I designed a survey questionnaire according to key factors and standards considered in evaluating instructional courseware and educational simulations.

To this end, the pilot study was conducted to test the data collection procedures of conducting the experiment; this process is thought to be essential for professional development (Albanese, 1993).

This led me to ask: can online simulated environments enhance the quality of education for pre-service teachers?

To begin this investigation, I chose simSchool as typical classroom simulation for teacher education because of its positive review on the Internet, and the fact that its free version was available and could be easily accessed online by student teachers.

I then started searching for the key factors and standards for evaluating instructional courseware and educational simulations for teacher education. My goal was to move beyond studying the traditional teacher education methods by investigating the effectiveness of working with simSchool as an online pedagogical simulation for preparation and education of pre-service teachers. My hope was that student teachers would benefit from the results of this study in their teaching experience, and that ultimately this would enhance the quality of education for prospective students. I also hoped that the findings of this research would help the developers of educational tools enhance the quality of future products for student teachers.

My evaluation of the effects of working with simSchool includes the participants' ratings of and comments about simSchool's various features, and the quantitative and qualitative analysis of their response and performance.

Chapter 2 provides a literature review that describes the key concepts associated with this thesis. Specifically, I discuss the importance of teacher education, following by addressing the flaws and limitations of the traditional teacher education programs that have stimulated a need for the new teacher education methods. I also talk about how the new methods of teacher education and the use of new educational tools such as simulations can enhance the quality of education for prospective teachers, and the ways by which using such methods can overcome the limitations of traditional teacher education programs.

In Chapter 3, I identify the process and the key factors that I have considered in designing the survey questionnaire for evaluating the effects of working with simSchool for student

teachers, describe the characteristics of the participants, and explain the data analysis tools and methods.

Chapter 4 presents the results of the analysis of participants responses and performances in the experiment of this study, describes the methods that I have used in analyzing the collected data, discusses their significance, and finally, presents the discussion of results and the limitations of the study. Chapter 5 describes the overall conclusions, contribution of this study, limitations and opportunities for future research.

2 Literature Review

This literature review aims to: 1) determine the challenges in current teacher preparation programs; 2) identify ways by which simulations can be used in addressing the current teacher preparation limitations; and 3) introduce an online simulation called simSchool which may facilitate teacher preparation practices.

2.1. Need for Teacher Preparation

Education is a fundamental base of development for youth, communities and countries. While societies all over the world try to enhance the quality of education and schooling for youth and children, it has also become crucial to pay attention to the quality of education for prospective teachers. Some research shows that teacher education programs are currently faced with at least two important issues that call upon a more sophisticated process of teacher education (M. Girod & G. Girod, 2008). On one hand, the number and complexity of skills and responsibilities required for teachers have significantly increased, and teachers are now expected to be highly versatile, responsive and "proficient in aligning, contextualizing, analyzing, explaining, adapting, instructing, and selecting important content, while operating within bureaucratic systems that typically do not support collaboration, reflection, planning, or professional growth" (M. Girod & G. Girod, 2008, p.1).

On the other hand, with increasing competition for available teaching jobs, "accountability has imposed upon teachers the necessity to demonstrate their competency in enhancing the students' education and learning" (M. Girod & G. Girod, 2008, p.1).

Over the past two decades, much attention has been focused on the issues surrounding educational reform, however, something still seems amiss in the process of teacher education. Some research has found that quality is the central challenge confronting the current teacher education programs. However, while research shows that quality of teaching is very important to

student achievement, schools and districts are facing increased pressure to improve students' learning and performance.

2.2. Traditional Teacher Education

Many research studies focus on the effects of situated cognition for improving the productivity of career competence (Brown, Collins, & Duguid, 1989; Lave & Wenger, 1991; McLellan, 1996, Lin, Hsu, & Cheng, 2011). Such research maintain that the theory of situated cognition can be used for addressing the challenges of professional development in teacher education. This idea suggests that practical experiences could potentially be helpful in enhancing pre-service teachers' cognition in an authentic teaching environment (Brooks, 1997).

"Therefore, it is suggested that pre-service teachers need a teacher education program that provides not only pedagogical knowledge but also teaching experience" (Lin, Hsu, & Cheng, 2011, p.1).

The concept of practice has been included in the structure of teacher education programs for many years. According to Arnett & Freeburg (2008), student-teaching practicum is one way for pre-service teachers to practice teaching. The knowledge and experience about students, and the school environment that are gained through the practicum can directly provide pre-service teachers with a realistic and tangible set of skills required for classroom teaching. These courses are intended to give pre-service teachers the opportunity of gaining practical experience and receiving feedback from experts and professionals. "Part of the attractiveness of the practicum experience has been that teacher educators could select sites to provide a "protected setting" in which teacher candidates could learn and grow" (M. Girod & G. Girod, 2008, p.3). Therefore, field experiences are often noted as the most important component of teacher education programs (Arnett & Freeburg, 2008).

2.2.1. Connection Between Theory and Practice

According to Arnett and Freeburg (2008), the term “field experiences” covers the entire range of in-school experiences, such as observation exercise in early field, structured course-related field experiences, and student teaching.

However, Arnett and Freeburg (2008) also mention that “field experiences do not duplicate real life” (Arnett & Freeburg, 2008, p.1), and such experiences “are often not meaningful and insightful for pre-service teachers, leaving them with an untrue perception of the duties of teaching” (Arnett & Freeburg, 2008, p.1).

Some research findings of analyses of practica’s benefits report that these practices have been insufficient in preparing beginning teachers for their teaching experience.

Different research shows that field experiences “are too often disconnected from, or not well coordinated with, the university-based components of teacher education” (Wilson, Floden, & Ferinni-Mundy, 2001, p. ii).

One of the central issues in teacher education has been the challenge of integrating theoretical knowledge that has traditionally been taught in university courses with the practical knowledge that can be gained through the practice of teachers and the realities of classrooms and schools. Hoy and Woolfolk (1990) found that pre-service teachers “are more likely to have unrealistic optimism teaching challenges in general, and will be confronted with reality shock as they begin teaching.

Also, student teaching in practica usually occurs at the conclusion of formal classroom preparation and preceding the first full-time teaching job” (Arnett & Freeburg, 2008, p.1), although this is not the case in the PDP at Simon Fraser University.

“During this critical time, pre-service students realize that either teaching is their desired career path, teaching is not for them and opt out, or earn their degree and choose not to teach. This emphasizes the importance of early field experiences” (Arnett & Freeburg, 2008, p.1).

Many schools report that a majority of beginning teachers are confused by how classroom teaching functions, and find it challenging to transfer what they have learned through theoretical courses in universities into their real classroom teaching experiences (Kiggins, 2001).

Other research such as Ramsey (2000) review of teacher education in New South Wales, Australia supports these findings, and claims that pre-service teachers find it difficult to apply what they have learned through their practicums for bringing about effective learning in students (Ferry et al., 2005). Kiggins (2001), also supports these findings through the reports on the results of interviews conducted with student teacher graduates, and stated that student teachers often leave university feeling under-prepared for teaching in classrooms, and confused by what will confront them when they start their teaching career. A significant focus of such challenges has been surrounding the issues of teacher quality and teaching competency (M. Girod & G. Girod, 2008).

Hoban (2002) asserts that such challenges exist because most traditional teacher education courses present a fragmented view of learning that can delay the progress of development and professional socialization for pre-service teachers. Consequently, there are not enough connections to the environment that the pre-service teachers' practices apply, and therefore, the related knowledge is not often retrieved in the required classroom situations (Bransford, Sherwood, Hasselbring, Kinzer & Williams, 1990).

Barth (1990) emphasized that professional growth of teachers is closely related to the link between teacher education programs and the classroom teaching experience. However, he also maintains that, "seldom do these two worlds converge" (Barth, 1990, p. 118).

Other research (Brookfield, 1995; Ferry et al., 2004) maintain that student teachers need to get close to the real experiences of students and teachers both cognitively and emotionally to understand how efficiently they can bring about the desired learning outcomes for students.

Teaching practices that excessively depend on traditional teaching strategies, such as theoretical lectures and textbook materials have been insufficient for enhancing students learning effectively (Bransford et al., 1990, Fischler, 2006). “These antiquated modes of instruction, with their corollary dependence on standardized testing, provide pre-service teachers with minimal conceptual transfer to real world scenarios and deprive them of spontaneous problem-solving opportunities” (Fischler, 2006, p.6). Some research supports the view about reliance on practica to provide needed practice and feedback (Allen, 2003; Ferry et al., 2005; Ramsey, 2000, Bransford, Franks, Vye & Sherwood, 1989).

2.2.2. Impact on Students

While practicum experiences do provide the opportunities for pre-service teachers enhance their teaching skills, they can have the potential “to expose the students to untried teachers, which could raise an ethical concern” (Cheong, 2010, p.1).

Some research maintains that schools that employ novice teachers find it difficult to provide the opportunity of practice for beginning teachers as the unintentional teaching errors of beginning teachers in such experiences cannot easily be compensated (Brown,1999).

Cheong (2010) also supports these findings and states that “unintended mistakes in practicing teaching may negatively impact students because in a real classroom any undesirable behaviors or mistakes by pre-service teachers cannot simply be undone” (Cheong, 2010, p.1).

Teacher education programs that provide practicum experiences to beginner teachers should take precaution in dealing with the students whom the novice teachers interact through practicing their professional skills. Cheong (2010) also emphasizes on the importance of program design and supervision in such practices and maintains that “in fields such as medicine or education, novices should be as prepared as possible for the practice experiences in order to inflict no harm on vulnerable students and patience. Therefore, these experiences should be

carefully designed to be effective and efficient“ (Cheong, 2010, p.3). Relying exclusively on practicum experiences may be problematic for prospective teachers, students and universities (Reichardt, 2000). Therefore, adoption of safe, easy and effective ways of providing teaching practice for pre-service teachers to enhance their sense of self-efficacy about teaching would be valuable (Cheong, 2010).

M. Girod and G. Girod, (2008), also maintain that practicing through practicum experiences can have negative outcome for the prospective teachers as “failure of that ‘try’, particularly if it results in chaos, may be difficult to overcome as supervisors may be horrified by such a debacle” (M. Girod & G. Girod, 2008, p4).

2.2.3. Availability of Traditional Teacher Education

On the other hand, different research shows that pre-service teachers classroom teaching practices are often “limited by the lack of regular access to quality classroom experience” (Ferry et al., 2004, p.2) such as school needs and availability, cost of practicum and course requirements which all place limits on the quality of pre-service teachers’ preparation (Ramsey, 2000). Such limitations may frustrate both teacher educators and student teachers, as the first year of teacher education is a crucial time for the beginning teachers to develop fundamental understanding of the essential concepts in real classroom teaching (Ferry et al., 2004) and about different aspects of their role as teachers (Brookfield, 1995).

2.2.4. Efficiency and Quality of Traditional Teaching Practices

Some research shows that a real classroom is often too complex for student teachers to practice and gain al required knowledge and skills for classroom teaching.

M. Girod and G. Girod (2008) refer to classroom management and discipline as the most significant challenges for beginner teachers, and state that there are many other teaching skills

inter-connected to these two challenges that make it difficult for novice teachers to gain adequate mastery skills required for classroom teaching during their field experiences (M. Girod & G. Girod, 2008).

The other skills of beginning teachers that have been identified by research as not well developed in traditional pre-service teacher preparation programs include: classroom management, creating collaboration, classroom decision making, dealing with individual differences, organizing class activities and assessing students learning. Practica may not be sufficient in allowing student teachers gain and demonstrate the required skills for teaching in complex environment of classrooms (Ferry et al., 2004).

2.3. New Teacher Education Methods

The challenges in traditional teacher education programs show that it has become necessary to seek alternative effective ways for improving teacher education practices. Cambourne, Ferry and Kiggins (2003) reported on using an approach called 'Knowledge Building Community' (KBC) that supported interactive knowledge building about the functionality of school and classrooms through problem-based learning. (Ferry et al., 2004)

M. Girod and G. Girod (2008) maintain that adequate practice activities should be: aligned with central skills required for mastering authentic tasks; repeatable so learners can learn by analyzing the outcomes; provide feedback and a setting in which failure and/or experimentation can occur safely; and be appropriately complex without becoming overwhelming (M. Girod & G. Girod, 2008, p. 4).

Using simulations for instruction as part of educational curricula is not a new concept (Cruickshank & Telfer, 1980, Grabinger, 1996). Simulations as learning environments have a long history of use in education and training (Ferry et al., 2004).

While many simulations such as role-playing games, card games, paper-and-pencil style games and other pedagogical innovations are very simple structured, they were designed to provide learners with learning experiences not easily found in the real world (Cruickshank, 1969). Different research state that much of the enthusiasm associated with using computer simulations in education context was related to the emergence of advanced and sophisticated simulations over the paper-and-pencil and film-based simulations (Hemphill, Griffiths, & Frederiksen, 1962; Kersh, 1963).

Realistic simulations can allow learners to experience real-world problems, understand complex issues, and help them in enhancing their problem-solving skills and abilities (Cruickshank, 1969). Since using computer technologies for assessment is generally not a disadvantage for students (Stephens, 2001), computer-based simulations can have the potential to allow users assess their proficiencies in various fields (Lainema & Nurmi, 2006; Fischler, 2006).

Although simulations are only representations of real-word situations, the complexity and the idea behind such practices still encourages learners to adopt higher-order thinking processes and in-depth analysis in order to cultivate a deep understanding of the related subjects. Since most simulations represent episodes of real-world experiences, learners may be evaluated on their problem-solving skills in different fields. (Fischler, 2006; Lainema & Nurmi, 2006).

“Educational simulations could enhance active learning, problem solving, and many other pedagogies endorsed by modern educational researchers” (Fischler, 2006 ,p.7).

In recent years many instructional digital environments use simulations to create a realistic representation of world in different enviornments (Ferry et al., 2004). Computer-based simulations also allow users assess their skills and proficiencies in various fields (Lainema & Nurmi, 2006).

Research and development of simulation games and virtual reality allow users to enhance their skills in managing complex situations in different environments and see the consequences of their decisions and actions. The examples of such simulation games include Sim Series, and Cilvilization. There are different opinions about the effectiveness of simulations that represent a situated learning model for learners. Tripp (1993), states that computer-based simulations which are based on a situated learning model of the environment have limited educational value because “true expertise is learned by being exposed to experts”, while other researchers such as Jonassen (2000), assert that computer-based simulations can be very effective tools for learning as they can represent significant elements of traditional apprenticeship.

Simulation can represent elements of real world situations, and allow users to practice decision-making by exploring different options in a safe learning environment. Some research reports that in the recent years different technologies such as Internet, web-based instruction, virtual classrooms, on-line performance systems, and distance education have also started contributing to the improvement of teacher education programs with innovative ways of instruction (Gillette, 1996; Khan, 1997; Smith & Southern, 1999; Hiltz, 1986; Smith & Jones, 1999; Dunlap, 1999).

Different approaches to the classification and definition of simulations are created based on the subjects which a simulation replicates, the tools and technologies which the simulation requires, and the fidelity level of the simulation. By being situated in the narratives of such simulations and virtual realities, users can learn how to become proficient in decision-making through complex situations and experience the consequences of their decisions in different situations (Grabinger, 1996).

M. Girod and G. Girod (2008), maintain that, many of the new innovations in the field of education are actually the enhancement of old-fashioned case-based teacher education models using multimedia and audiovisual components to support experiential learning practices, and

occasionally, also they are fully-developed simulated experiences. This just a part of a broader change in the development of instructional games and simulations, and their effects on cognition and social psychology (Ferry & Kervin, 2007; Gibson, 2007, Kilbane, 2007; Ochoa & Leafstedt, 2007; Aldrich, 2005; Gee, 2003; Turkle, 1995; diSessa, 2001; Solomon, 1997).

However, according to M. Girod and G. Girod (2008), in spite of such movements in the use of simulations in formulating principles and exploratory investigation, the field of educational technology still requires a much more sophisticated and structured framework in its development progress The objective of such efforts is to help prospective teachers adopt intellectual solutions over the emotional ones in their teaching practices (Cruickshank & Broadbent, 1969).

2.3.1. Classroom Decision-making

Danielson (1996) states that “a typical teacher on average can make over 3000 non-trivial decisions per day” (Danielson, 1996, p.2). However, it is not always possible for pre-service teachers to have sufficient opportunities for practice teaching before their real classroom teaching experience. Some research state that student teachers learning may be enhanced when they practice decision-making in situations akin to the ones that teachers encounter in real classroom settings (Ferry et al. 2004; Kiggins 2001; Groundwater-Smith, Deer, Sharp, & March, 1996)

However, other research consistently shows that pre-service teachers’ classroom experiences are usually limited by the lack of regular access to quality classroom experiences (Ramsey, 2000). This challenge can frustrate both teacher candidates and their instructors as the first year of teacher education programs are intended to give student teachers the opportunity of developing fundamental understandings about their roles and responsibilities as teachers (Ferry et al., 2005).

Student teachers need to see the consequences of the complex decisions that teachers make in different situations of learning environments (Brookfield, 1995). Specially, they need to see how decisions made about managing student behavior and classroom activities contribute to student learning outcomes. However, many challenges such as the cost of the practicum, school needs, school availability and university course requirements place limits on reaching the expected quality of classroom practices. Therefore, other alternative ways of providing such experiences with classroom-based teaching episodes are required (Ferry et al., 2005).

One of such approaches is to make use of simulated classroom environments by which pre-service teachers can engage in typical classroom activities in different situations.

Simulations may be able assist users in seeing the consequences of the complex decisions teachers make in managing learning environments. In particular, simulations have been employed as a way to engage users by making decisions about student behavior, classroom organization, and learning how such decisions impact students' learning outcomes (Ramsey, 2000).

As well, many writers claim that simulation can support pre-service teachers to enter into "an intellectual partnership with the computer" (Jonassen, 1996), and that by this medium, users can get engaged in teacher and students' experiences (Brookfield, 1995), and understand the way they feel and respond both cognitively and emotionally through different learning tasks (Ferry et al., 2005). Limited research has been conducted on simulations for teachers' development. However, advances in educational software demonstrates that creative and motivational simulations can support pre-service teachers to see the effects of classroom management decisions from multiple perspectives while allowing them to get close to both the teacher's and student's experiences of learning episodes (Aldrich, 2004).

2.3.2. Practice through Repeating, Getting Feedback and Advice

Furthermore, simulations can be designed to incorporate feedback and advice and provide the opportunity to pause or repeat a lesson and explore alternative decisions. Through this technology, pre-service teachers can repeatedly practice their teaching skills without negative impact on students, and get engaged in an active problem-solving experiences (Ferry et al., 2004).

These are usually not feasible options in real classroom settings. However, educational simulations allow students to learn by acting within virtual environments and immediately applying theory to practice in realistic yet controlled settings. Simulations may easily be added as a complement to standard pedagogical practice but not as a replacement. For instance, a simulation could be the hands-on activity for a course in the same way a lab component may support a lecture. In addition, a simulation can provide authentic and relevant scenarios with making use of controlled situations that stimulate users' emotions, and provide unrestricted options in response. Moreover, simulations can be replayed (Aldrich, 2004).

Software simulations permit a repetition of the behavior, which is difficult or impossible to implement in the classroom. Thus, simulations are considered as representations of real-life experiences, and although they may not be able to replace the classroom experience completely, they can have certain features to enhance real-life experiences (Aldrich, 2004).

Research on the new generation of simulations, focusing on advanced computer and multimedia technologies, shows that simulation-based learning (SBL) has become even more popular, economical and feasible than before (Fischler, 2006, Lane, 2005; Sun & Lin, 2001).

Many of these studies can be counted as “a comparison between a expository instruction with a simulation component, and expository instruction without a simulation component” (Fischler, 2006, p.7).

The results from the analyses of such studies showed different findings of using simulation components. Some reported favorable results, while others reported no significant difference, or mixed results (Fischler, 2006; Carlsen & Andre, 1992; Chambers et al., 1994; Grimes & Willey, 1990)

2.3.3. Self-efficacy in Classroom Teaching

Teachers’ self-efficacy has been defined generally as a belief on their ability to influence students’ learning. Previous researchers have suggested that a teacher who has high level of self-efficacy tends to spend more time teaching students (Riggs & Enochs, 1990), and the sense of self-efficacy is one of the variables highly related to student motivation and achievement (Ashton & Webb, 1986; Midgley et al, 1989).

A teaching practicum is one way for pre-service teachers to have an opportunity to practice teaching (Mule, 2006). In the pre-service teacher education programs, attending lectures about teaching and learning, practicum teaching experiences in classes, and student teaching in the field should be connected successively so that they build a teacher’s self-efficacy.

According to Rokeach (1968), practicum experiences provide practice opportunites that can have direct effects on student teachers’ beliefs and behaviors. However, it is not always possible for pre-service teachers to have adequate teaching practices before to their real teaching experience. In virtual worlds such as games and simulations, users can connect with others’ avatars and experience a feeling of presence through role-play that enables them to join the community of practice (Lin, Lin, & Huang, 2008; New Media Consortium & ELI, 2007).

Some researchers such as Bandura (1997) state another reason why virtual learning environments may be able to enhance the feeling of self-efficacy in teacher candidates. As users in such environment can participate anonymously in such teaching practices, these environments can provide learners with the opportunity of overcoming their state of tension or shyness, and encourage their active participation (Bandura, 1997)

2.3.4. Collaboration and Social Interactions

Many research state that simulations and virtual worlds can also enhance social interaction in teaching and learning (De Lucia, Francese, Passero, & Tortora, 2009; Jamaludin, Chee, & Ho, 2009). Through the opportunities of collaboration and participation, such interactions allows pre-service teachers' to practice teaching and develop practical knowledge of the learning subjects (Eick & Dias, 2005). Therefore, this idea suggests that in order to enhance the quality of teaching practices, the collaborative approach to classroom teaching is more important than the individual one (Bullough, Young, Birrell, & Clark, 2003; Bullough et al., 2002; Eick & Dias, 2005; Jang, 2008).

Collaboration can have a positive impact on pre-service teachers learning as it can reduce the excessive cognitive load of learners (Kirschner, Paas, & Kirschner, 2009), and allow them to reflect their practical knowledge and skills through different practices (Kang, 1995).

2.4. simSchool Simulation

Differing results about the effectiveness of simulations show that simulations of different designs and different qualities may bring about significantly different effects on the learners (Reichardt, 2000). Many researchers state that in spite of different studies on advantages of simulations, the academic merits of such tools for teaching and learning is still inconclusive (Rieber & Parmley, 1995; Swaak, Jong, & van Joolingen, 2004).

Although there are many relevant pedagogical perspectives that can be drawn upon to legitimize simulation use few truly effective educational simulations are available. simSchool is a classroom simulation that is designed to provide pre-service teachers with the opportunity practicing different classroom teaching skills.

“simSchool is a classroom simulation that supports the rapid accumulation of teacher's experience in analyzing student differences, adapting instruction to individual learner needs, gathering data about the impacts of instruction, and seeing the results of their teaching.” (simSchool, About section, para. 1).

The player in simSchool has the role of a teacher of 7^{th}-12^{th} grade students and is responsible for teaching and managing a classroom. simSchool provides student teachers with the opportunity of practicing required classroom teaching skills through "analyzing student differences, adapting instruction to individual learner needs, gathering data about the impacts of instruction, and seeing the results of their teaching" (simSchool, About section, para. 1).

According to Zibit and Gibson, (2005), “In simSchool, the teachers’ choice of interaction affects simStudents' academic and behavioral responses. By interpreting signs of performance and behavior, the player as a teacher should make decisions that help students on their given learning tasks” (Zibit & Gibson, 2005, p.2). The player with the role of a teacher in simSchool makes series of instructional decisions and must respond to the simStudents’ different comments, responses and questions.

The player in simSchool should also pay attention to each simStudent's individual personality, characteristics, and learning needs. As the simulation runs, the user is required to make many decisions about organizing the lesson, classroom management, and responses to individual students. These issues have been reffered to as significant areas that underlie the quality of instruction for teachers (Nelson, 2002).

Figure 1. simSchool Class and simStudents' Profile

Note. The images are snapshots from simSchool online simulation, www.simSchool.org

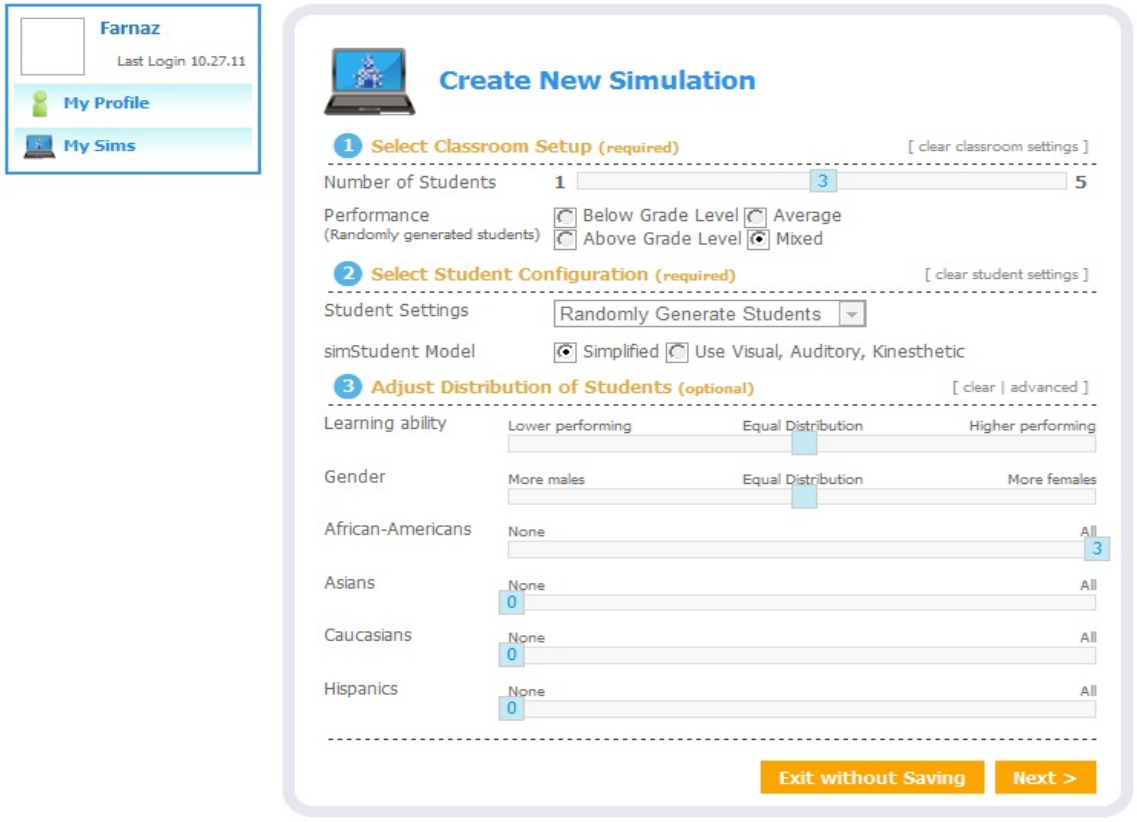
The player in simSchool should select "tasks and conversational exchanges that best match with different students' needs" (Hettler, Gibson, Christensen, & Zibit, 2008, p. 6). The students in simSchool respond to tasks with changes in their posture and statements.

Based on their experience with this simulation, student teachers can practice decision-making and refine their strategies and approaches for classroom teaching (Zibit & Gibson, 2005).

This research aims to evaluate simSchool (v.1), as an online simulation for pre-service teachers by identifying how student teachers rate this simulation as a teacher preparation tool, and the strong and weak points of using it to enhance the quality of teacher education programs.

The new version of simSchool (v.2) was released and launched on October 19, 2011, and was not available at the time of this study. In simSchool (v.2) users can choose one, two, three, four or five simStudents to work with, adjust the distribution of simStudents' backgrounds and create them according to their preferences.

Figure 2: The New simSchool Customization Options



Note. The image is a snapshot from simSchool online simulation, www.simSchool.org

3 Evaluation Design and Procedures

This section describes the standards and factors that I have considered in evaluating the effects of working with simSchool simulation software for pre-service teachers. I used an evaluative framework that served as a blueprint for the simSchool survey questionnaire and outlined the way that these standards would be addressed.

By running a pilot test on this platform, I tested this prototype before conducting the data collection of this study with the main participants who were student teachers studying in the Professional Development Program (PDP) at Simon Fraser University (SFU).

I considered two methodologies when evaluating the design and effects of simSchool simulation for pre-service teachers: an instructional design methodology oriented to evaluating instructional tools, and the Donald Kirkpatrick's Four Level Evaluation Model for evaluating educational programs (Kirkpatrick, 1994). The first methodology includes the six-step approach for evaluating the instructional programs for classroom teachers (Fleischman & William, 1996):

Step 1: Defining the Purpose and Scope of the Evaluation

Step 2: Specifying the Evaluation Questions

Step 3: Developing the Evaluation Design and Data Collection Plan

Step 4: Collecting the Data

Step 5: Analyzing the Data and Preparing a Report

Step 6: Using the Evaluation Report for Program Improvement

I also considered the Kirkpatrick's four-level of training evaluation model in evaluating instructional design tools as below:

Level 1: Reaction:

Kirkpatrick's first level of evaluation is **reaction**, which measures how the participants in the learning experience feel about the experience (Kirkpatrick, 1994). This level was addressed by collecting reaction data from the student teachers participating in the simSchool simulation experiment through the questionnaire that I designed by considering the standards of educational simulations. Since the classroom simulations may well color the student teachers' reactions to the real classroom environment, in the designed questionnaire the participants were asked about their experience of using simSchool simulation from different perspectives such as increasing their knowledge, skills and confidence about real classroom teaching experiences.

Level 2: Learning

Kirkpatrick's second level of evaluation is **learning**. He defines learning as the degree to which participants in the program change attitudes, improve knowledge, or increase skill as a result of the program (Kirkpatrick, 1994). The learning attributed to working with the simSchool simulation experiment was evaluated by the questions in the questionnaire that sough the ratings of the participants on their attitudes. On the other hand, the simSchool results in the forms of visual diagrams and scores on the two measurement factors of 'task_appropriateness' and 'learning_scores' generated at the end of each round of working with simSchool simulation, and comparing the results of each round of the experiment with those of previous rounds also reflected the participants' skills and knowledge on working with simSchool simulation.

Level 3: Behaviour

Kirkpatrick's third level of evaluation is **behaviour**. He describes behaviour as the degree to which learners have changed their behaviour outside of the learning environment because of their participation in the learning activities (Kirkpatrick, 1994). As the time and availability of student teachers were limited, this level studying about this level of Kirkpatrick's model was not a feasible.

Level 4: Results

The fourth level of evaluation in Kirkpatrick's Framework is **results**. Results refer to the degree to which the output of the participant's workgroup or organization has improved because of the learning program (Kirkpatrick, 1994). As studying about this level of Kirkpatrick's model was also restricted to the participants' availability and the research period, studying this level in Kirkpatrick's model was not a feasible option in this study either.

3.1 Defining the Purpose and Scope of the Evaluation

The first step in the process of this research was to define the purpose and scope of using effective teacher education methods that would benefit pre-service teachers as well as the ultimate students as learners. The purpose and the need for the new teacher education methods in general and the use of simulation for teacher preparation specifically are summarized in the literature review of this research in Chapter 2.

3.1.1 Participants

As the focus of my research was on the use of simulations for preparation and education of pre-service teachers, for the data collection phase of this study, I recruited student teacher participants from the Professional Development Program (PDP) at Education department of Simon Fraser University (SFU).

The PDP at SFU is an established teacher education program with a distinguished reputation. The program is made up of a combination of practicum experiences and professional coursework integral to the understanding of important educational ideas and their application to classroom practice. When student teacher candidates successfully complete the program, they are recommended to the British Columbia College of Teachers (BCCT) to receive a BC Teaching Certificate. The Professional Development Program at SFU has two entries in Fall and Spring. The sequence and the details of courses for the two groups are described below:

Fall Entry

Fall – Education 401/402: Integration of theory and practice (comprised of four workshops and observations in schools)

Spring - EDUC 405: Teaching semester (comprised of four workshops and teaching practice)

Summer - EDUC 404: Professional coursework semester

Spring Entry

Spring - EDUC 401/2: Integration of theory and practice (comprised of four workshops and observations in schools)

Summer - EDUC 404: Professional coursework semester

Fall - EDUC 405: Teaching semester (comprised of four workshops and teaching practice)

Some of the PDP students who were recruited in this study had started this program in the Fall 2010 and were in their third and last semester of taking professional coursework (EDUC 404). These students had taken their first semester comprising of six weeks of theory classes (EDUC 401/402: Integration of theory and practice), and their second semester for teaching practice comprising of 10-12 weeks of student teaching experience (EDUC 405: Teaching semester). Others had completed EDUC 401/402 and were taking professional coursework (EDUC 404). The student teacher participants in this study:

- were in their mid-twenties
- had a variety of experience with using computers, internet and simulation for education
- had a variety of level of teaching knowledge, practice and experience
- were both male and female student teachers
- were both Elementary and Secondary program focus in their PDP program.

3.2 Specifying the Evaluation Questions

The overall objective of simSchool is to provide pre-service teachers with a safe environment for experimenting and practicing new techniques, especially methods of addressing different learning styles, and wide variations in academic and behavioral performance of students. The objective of a simSchool user is to align the instructional tasks and conversations with the capabilities and characteristics of the simStudents in order to learn how to reduce barriers to learning and engender positive academic outcomes.

The program seeks to help novice teachers more rapidly develop maturity and expertise in adapting teaching to the diverse needs of all learners and increase retention rates of new qualified teachers. simSchool was designed to provide pre-service teachers with a safe environment for experimenting and practicing new techniques, especially methods of addressing different learning styles, and wide variations in academic and behavioural

performance of students. As it was mentioned previously, the goal of this research was to evaluate the effects of using simSchool simulation as a tool for improving pre-service teachers' education prior to their real classroom teaching experience. The main evaluation questions of this research are as follows:

1. How do student teachers view simSchool as a helpful tool to prepare them for their authentic classroom teaching experiences?
2. How do student teachers rate simSchool as a teacher preparation tool?
3. What do student teachers see as the strengths and weaknesses of simSchool?
4. What features of simSchool need to be improved in order to meet student teachers' perceived preparation needs?

If the above-mentioned questions are addressed properly, they can clarify many gaps in the development of simulations for teaching education. Student teachers may also benefit from the results of this study in their teaching practices. Furthermore, finding answers to these questions may assist the developers of simulations like simSchool to improve the quality of their future simulation products according to student teachers' needs. This may ultimately as well promote higher quality teacher preparation, and enhance the education for students who benefit from well-prepared teachers.

3.3 Developing the Evaluation Design and Data Collection Plan

In order to evaluate the functionality and the effectiveness of simSchool simulation for pre-service teachers, I designed a survey questionnaire that would cover various aspects of evaluating pedagogical software and simulations for student teacher participants. For this purpose, I explored and collected the standards and factors considered in evaluating educational courseware and used them in designing the survey questionnaire for simSchool experiment.

As mentioned by different studies, learning from educational simulations like simSchool depends on many factors such as the quality and fidelity of the educational simulation and the technology used, the amount of practice and time spent working with the simulation, as well as the learners' background, pre-requisite knowledge and experience of the subject matter.

According to the educational and pedagogical simulation design, effective educational courseware should have the features summarized in Table 1 (Granland, Bergland, & Eriksson, 2000; Brown et al. 1989; Gibbons et al., 1997; Alessi & Trollip, 2001; Moore et al., 1996; Wilson & Cole, 1996; Heinich et al., 1999; Duffy & Cunningham, 1996).

Table 1. Features of Effective Educational Courseware

▪ be motivational ▪ have high fidelity ▪ have educational value ▪ provide reusability ▪ be leveled according to the users' ability ▪ address the curriculum standards ▪ be aligned with the defined learning objectives ▪ be credible and reliable for use in its targeted learning context ▪ provide appropriate audiovisual features ▪ be aligned with the users' conception and experience ▪ be applicable and adaptable to different conditions and situations ▪ cover the key concepts and factors of the targeted learning subject	▪ allow to be adopted and be used both as an integrated part of a program, as well as an independent learning component ▪ have a clear and defined design purpose ▪ be engaging and entertaining ▪ provide interactivity for users ▪ provide users with feedback and advice ▪ be free of racial, ethical and gender stereotypes ▪ give users control over the rate and the sequence of running the application ▪ be flexible to be adoptable by different users in various ranges of contexts ▪ enhance the quality of learning and understanding for the purposed learning subject

Taking into consideration different factors and standards mentioned in the previous section regarding the evaluation of educational courseware, I designed a questionnaire that

would cover all key concepts and various aspects of evaluating simSchool simulation thoroughly.

I considered two different types of questions in designing the survey questionnaire for simSchool: The first type of questions asked respondents to provide background information, which would describe the sample, allow detecting any correlations between such variables as experience level or gender and the subject's performance on the learning exercise. The second type of questions were created according to the factors and standards associated to designing educational courseware such as simulations for pre-service teacher education.

The survey questionnaire provided a framework for this evaluation. The questionnaire was deliberately quite detailed, as a key goal was to point out different types of problems and to ensure that the participants felt free and able to evaluate different aspects of working with simSchool simulation as an educational tool.

The survey questionnaire consisted of five detailed scale items, followed by three open-ended questions at the end that sought the student teachers' responses. The following areas were addressed in the questionnaire:

- Participants background information (e.g. their current semester, gender, teaching focus in their PDP program, computer experience, experience of working with simulation, amount of time used while working with the simulation)
- The ratings of student teachers on different features of simSchool simulation on students and classroom environment from the following aspects:
    - Students' characteristics
    - Teaching environment
    - Teaching actions
    - Students' behaviors
    - Students performance/learning outcomes

- The ratings of student teachers on the effectiveness of simSchool simulation for improving classroom teaching from the following perspectives:
    - Needs assessment
    - Classroom activity and time management
    - Teaching behaviors
- The ratings of student teachers on different aspects and specifications considered in designing and implementing simSchool
- The ratings of student teachers regarding the effects of simSchool on them from the following viewpoints:
    - Improving their skills
    - Increasing their knowledge
    - Enhancing their confidence
- The student teachers' most liked and least liked feature in using simSchool
- Student teachers' comments, suggestions and feedback on improving simSchool simulation and its use for the education of pre-service teachers

A copy of the designed survey questionnaire can be found in the Appendix C at the end of the thesis.

3.4 Collecting the Data

In order to examine the feasibility of conducting the simSchool experiment in data collection phase, testing the data collection procedure, and to receive feedback about the questionnaire prior to the main experiment for student teachers, I conduced a pilot test of this study first with five international Ph.D. students studying in the 'Curriculum Theory and Implementation' program in the Faculty of Education at SFU.

3.4.1 Pilot Study

I found the pilot study to be very useful as it provided me with the opportunity to learn about the overall understanding of the opinions, perceptions, and reactions of students who play simSchool. The purpose was to make an initial judgment about its potential as an educational tool, to provide guidance in the further evaluation of working with simSchool simulation, and to test the experimental procedures. The same procedures for conducting the simulation experiment was later conducted with student teachers that were the main participants of this study, as will be described in the following section. As a result of the pilot study, the timing schedule for the experiment was adjusted, and more time was allowed for hands-on experience by the participants.

3.4.2 The Main Experiment

On each round of data collection of this thesis, the purpose of this research was described for participants, and they were asked to register in the free version of the simSchool simulation online by using their email and choosing a password. In order to collect data from the diagrams and Excel spreadsheets generated by the simulation as the results of student teachers' performance, I collected and kept a record of the participants' email addresses and passwords used for registration in the simulation.

In the free version of simSchool, which is accessible for everyone online, the users can choose working with 1 or 5 simStudents. The full version of simSchool provides an additional option for choosing 18 simStudents for the classroom size, however, as most participants of this study were novice simulation users preparing to become teachers and the time was limited, they were asked to work with one and then with five simStudents in simSchool. Although this was not an authentic teaching experience from the class size perspective, it was authentic with regard to the student teachers' actions.

Also the simulation difficulty level increases by increasing the number of simStudents. So to challenge the student teachers at different difficulty levels of the simulation, I asked student teachers to work with one and then with five simStudents.

Therefore, for the first round of this experiment all participants worked with one simStudent for practice, and then worked with one and five simStudents respectively for the second and third rounds of using the simulation in the main experiment.

The simSchool simulation allows users to choose fixed or random personalities for their simStudents. Each simStudent in the simSchool has an individual personality, and the user as a teacher can get to know about simStudents' personalities by clicking on the teacher's laptop and reading simStudents' profiles.

When choosing 'fixed personalities' for simStudents, in each time of working with the simulation, the simStudents personalities will not change and simStudents will have the same personalities in each time of working with the simulation. However, if choosing 'Random personalities', the personalities of simStudents will be chosen randomly in each time of working with the simulation. As I wanted to evaluate the effects of working with this educational simulation in the same and equal condition for all student teachers, I asked all participants to choose fixed personalities and not random personalities for their simStudents.

Explaining followed each round of working with the simulation and debriefing the results of participants' performance shown in forms of linear diagrams and Excel spread sheets by the simulation.

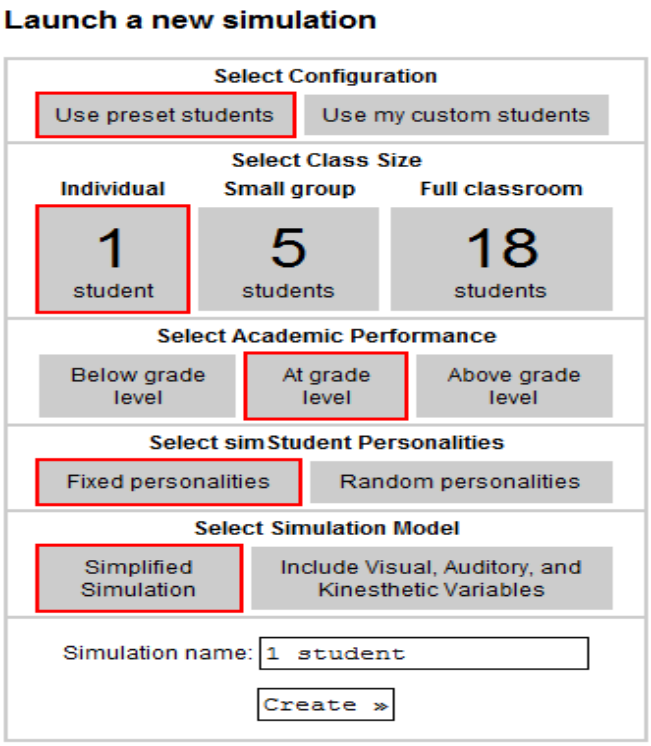
3.4.2.1 Data Collection Procedures

In each round of the experiment in the data collection phase of this study, the participants were presented with an introduction and demonstration of working with simSchool simulation, and were asked to work with the simulation by keeping track of their time through the following steps:

1. Participants were presented with a demo of simSchool and were asked to choose "Use Preset Students" for configuration;"1 student" for the classroom size, "At grade level" for academic performance, "Fixed personalities" for simStudents personalities, and "Simplified Simulation" for Simulation Model, name the simulation "Practice" (10 real minutes)
2. Participants were then asked to work with 1 simStudent for practice the for 120 simMinutes (20 real minutes). One simMinute in simSchool is equal to 10 seconds in "real" life.
3. Student teachers were presented with the explanation and debrief to their performance results through the diagrams and Excel spread sheets generated by the simulation (10 real minutes).
4. Participants were then asked to choose the same configuration chosen for their practice period again, name it "1 student" this time, and work with the simulation again for 120 simMinutes. This time with having familiarity with the way that simulation works, they were asked to try on improving their performance generated in the practice round of the experiment (20 real minutes).

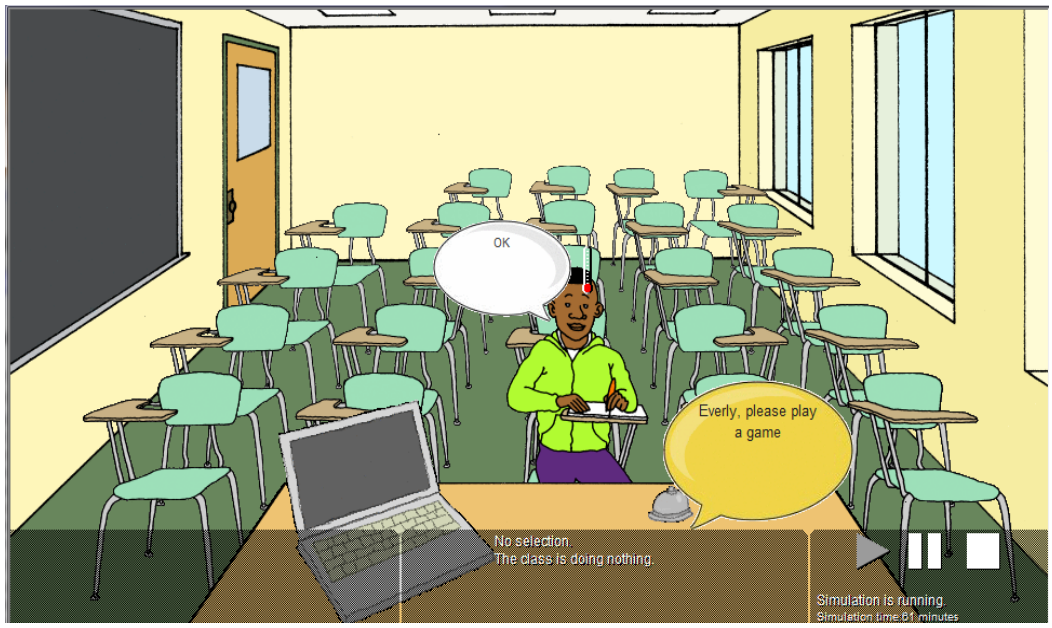
5. Participants were then presented with an explanation and debrief of their performance results separately (10 real minutes).
6. Student teachers were then asked to choose “Use Preset Students” for configuration; “5 student” for the classroom size, “At grade level” for academic performance, “Fixed personalities” for simStudents personalities, “Simplified Simulation” for Simulation Model, name the simulation “5 Students”, create and start working with the simulation for 120 simMinutes (20 real minutes).
7. Participants were then again asked to explore the results of their performance and compare them with those of their previous performance (10 real minutes).
8. Participants were asked to fill out the questionnaire for 30 minutes (20 real minutes)

Figure 3. Setting Configuration for Working with 1 simStudent



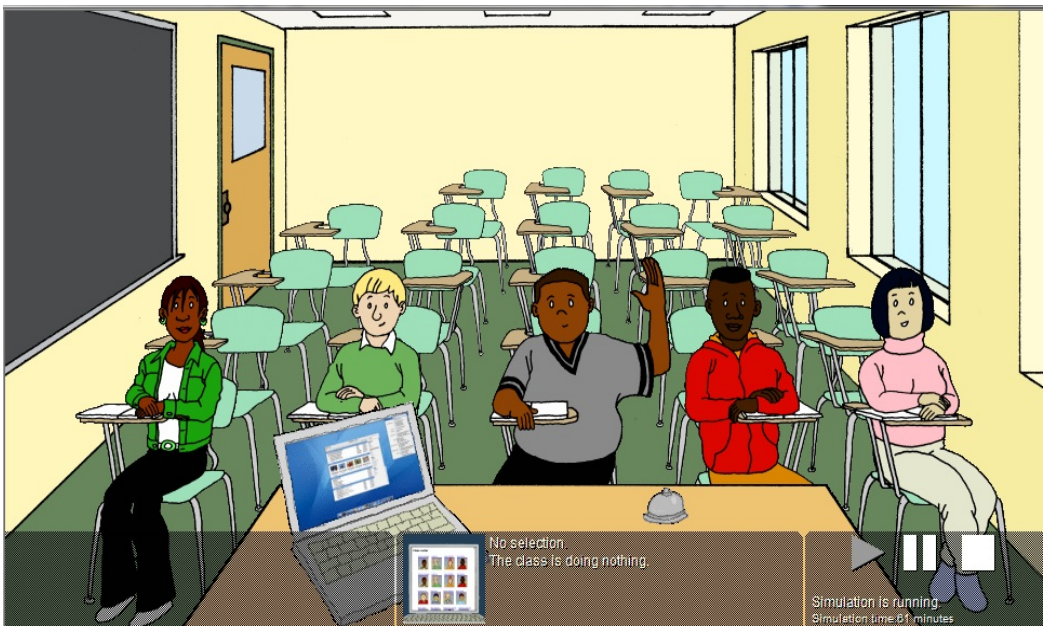
Note. The image is a snapshot from simSchool online simulation, www.simSchool.org

Figure 4. Working with 1 simStudent



Note. The image is a snapshot from simSchool online simulation, www.simSchool.org

Figure 5. Working with 5 simStudents



Note. The image is a snapshot from simSchool online simulation, www.simSchool.org

Figure 6. simStudents' Performance Diagrams

Note. The images are snapshots from simSchool online simulation, www.simSchool.org

Table 2. Tasks and Approximate Times in Each Step of the simSchool Experiment

Step No.	Step in Experiment: Task	Time
1	Demo & Introduction	10 Minutes
2	Working with 1 simStudent (Practice)	20 Minutes
3	Debrief of Step 2	10 Minutes
4	Working with 1 simStudent (Main experiment)	20 Minutes
5	Debrief of Step 4	10 Minutes
6	Working with 5 simStudents (Main experiment)	20 Minutes
7	Debrief of Step 6	10 Minutes
8	Filling out the Questionnaire	20 Minutes

3.4.2.2. The Design of simSchool

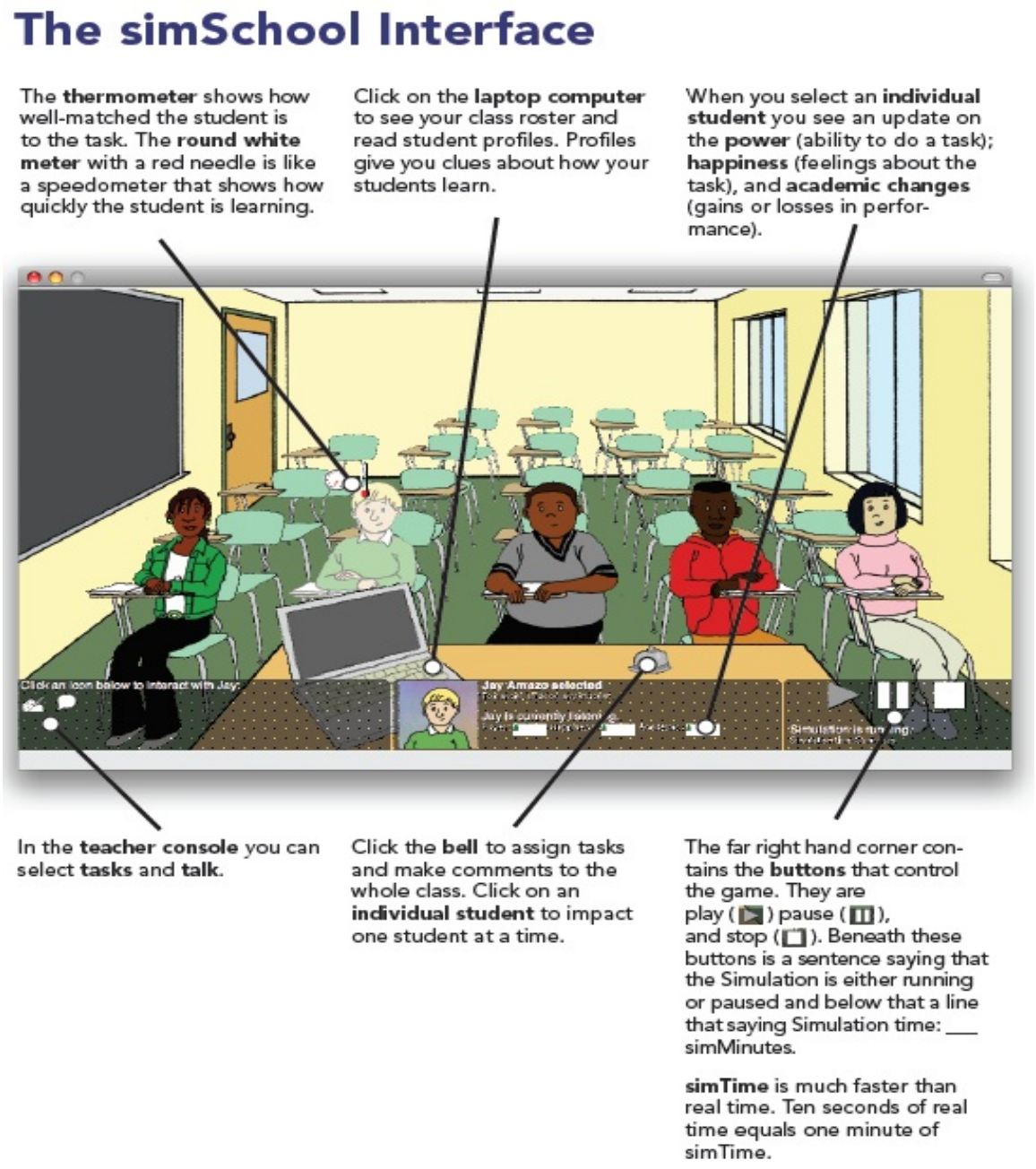
In simSchool each simStudent in the class has an individual personality with settings on six dimensions:

1) Expected academic performance, 2) Openness to learning, 3) Conscientiousness toward tasks, 4) Extroversion or introversion, 5) Agreeableness, and 6) Emotional stability. (Hettler, Gibson, Christensen, & Zibit, 2008, p. 6).

The user in simSchool has a role of a teacher of elementary school grade students and can learn about each of the simStudents by reading their student profiles that include statements about their behavior and learning preferences. In simSchool classroom, the user should select tasks and conversational exchanges that best fit the students' needs. Students respond to the tasks with changes in their posture and statements. While working with simSchool, the user makes decisions and experiments in a virtual classroom. Then based on what happens the user should refine the strategies of working with the simStudents.

With simSchool the user plays to learn to develop expertise and think like a teacher. In simSchool, success comes through helping your simStudents improve, both in their academic performance and their behavior. Figure 1 shows the control options in simSchool classroom interface.

Figure 7. simSchool Classroom Interface



Note. Image from simSchool online manual, www.simSchool.org

3.5. Analyzing the Data and Preparing a Report

As I collected both quantitative and qualitative data for this study, I analyzed each type of data separately and looked for consistency in the two types of data. The qualitative data was gathered from the three open-ended questions at the end of the survey: The student teachers' responses on their most liked and least liked features in simSchool, as well as their feedback, comments and suggestions on simSchool as an educational tool for enhancing their education. Their responses were then analyzed and categorized by creating themes and categories.

The quantitative data collected from the student teachers' responses to the other questions of the questionnaire, on the other hand, were analyzed using the Statistical Package for the Social Sciences (SPSS v.19) software, and reported through the tables, charts and diagram generated by the SPSS software package. The Research Ethics Broads of Simon Fraser University (SFU) granted approval for the research and the survey.

3.5.1. Statistical Package for the Social Sciences (SPSS) Software

SPSS (Statistical Package for the Social Sciences) is a computer application that provides statistical analysis of data, and is now called PASW. SPSS is used for advanced and complex calculations to analyze numerical and quantitative data in social sciences, education and many other fields. I chose using SPSS 19 for analysis of data collected by the questionnaire to ensure the accuracy of the results. As well, I chose this software for quantitative data analysis as SPSS is a very well recognized and reputable statistical data analysis software package.

3.6. Using the Evaluation Report for Program Improvement

The last step in evaluating simSchool as an educational simulation for teacher education was reporting the findings of both quantitative and qualitative data gathered and analyzed through the previous steps. These findings are shown and explained in Chapter 4.

4 Findings

4.1. Closed-ended Survey Questions

Participants' Background

The great majority of participants (71.4%) were attending Educ 404. This means that most were in their final semester of their teacher education program and had completed four months of practice teaching in real classrooms. Almost two thirds (62.5%) had begun their program in the previous Fall semester, and almost two third (63.2%) were specializing in teaching at Elementary school level.

Table 3. Participants' Background *

Item	Frequency	Percentage (%)
CURRENT COURSE (n=21)		
Educ 401/2	1	4.8
Educ 405	0	0.0
Educ 404	15	71.4
Other	5	23.8
BEGINNING SEMESTER (n=16)		
Fall	10	62.5
Spring	6	37.5
TEACHING FOCUS (n=19)		
Elementary	12	63.2
Secondary	7	36.8
GENDER (n=22)		
Male	3	13.6
Female	19	86.4
COMPUTER SKILL (n=21)		
Novice	2	9.5
Intermediate	14	66.7
Proficient	5	23.8
USED COMPUTER-BASED SIM FOR EDUCATION (n=22)		
No	15	68.2
Yes	7	31.8
USED COMPUTER-BASED SIM FOR OTHER CONTEXT (n=19)		
No	3	15.8
Yes	16	84.2
PLAN TO USE SIMULATION STRATEGIES IN CLASSROOM (n=22)		
No	2	9.1
Yes	4	18.2
Not Sure	16	72.7

* The question was: “Please choose the appropriate option for each question.”

The great majority of participants (86.4%) were female. Two-thirds rated their computer skills as intermediate. Less than a third (31.8%) had used computer-based simulation for education but the majority (84.2%) had used computer-based simulations in other contexts. Less than 20% (18.2%) planned to use simulation strategies in the classroom. Finally, almost three quarters (72.7%) responded that they were not sure whether they wanted to use simulation strategies in the classroom in the future.

Realism of simSchool Features

Table 4 reports on the participants' ratings of various simSchool features. Three simSchool features were rated highly: "Teachers' challenges represented in simSchool" (mean=3.73). Students' profiles were rated highly as well (mean=3.71) since these were represented in a format similar to the one used in many schools.

Table 4. Participants' ratings of realism of simSchool features*

Feature	N	Mean (sd)**	Very Unrealistic (%)	Unrealistic (%)	Unsure (%)	Realistic (%)	Very Realistic (%)
The characteristics of simStudents compared to the characteristics of real high school students	22	3.27 (1.03)	9.1	9.1	31.8	45.5	4.5
Students' profiles	21	3.71 (0.78)	0.0	9.5	19.0	61.9	9.5
The design of the simSchool classroom compared to a real classroom situation	22	2.91 (1.19)	18.2	18.2	18.2	45.5	0.0
simStudents' behaviour	22	3.05 (1.11)	4.8	38.1	9.5	42.9	4.8
The outcome of simStudents' academic performance	22	3.09 (0.75)	0.0	22.7	45.5	31.8	0.0
Conversations between you as a teacher and simStudents	22	2.23 (1.15)	27.3	45.5	9.1	13.6	4.5
Options for assigning academic tasks to simStudents	22	2.77 (1.02)	9.1	36.4	22.7	31.8	0.0
Teachers' challenges represented in simSchool	22	3.73 (0.82)	0.0	9.1	22.7	54.5	13.6

* The question was: "How realistic did you find the following features of simSchool:"
** Based on a five-point scale: 1= very unrealistic; 5= very realistic.

Finally, the characteristics of simStudents compared to the characteristics of real high school students' was rated most highly (mean =3.71) as being realistic. However,

“Conversation between you as a teacher and simStudents” was rated poorly as being unrealistic (mean=2.23). This is likely due to the simSchool interface, which requires users to select their actions from a pre-determined set of choices.

Effectiveness of simSchool

Participants’ Ratings of simSchool Effectiveness

Table 5 reports on the participants’ ratings of the effectiveness of the simSchool simulation from different perspectives involved in classroom teaching experience.
As the table shows, the items rated highly as effective among the simSchool features were‘Learning about different students characteristics’ (mean=3.14), ‘Paying equal attention to students’ (mean=3.14), ‘Classroom decision making’ (mean=3.05), and ‘Encouraging creativity in classroom activities’ (mean=3.00).

Table 5. Participants' Ratings of simSchool Effectiveness*

	n	Mean (sd)**	Very poor (%)	Poor (%)	Good (%)	Very Good (%)	Excellent (%)
Learning about different student characteristics	22	3.14(0.99)	4.5	18.2	45.5	22.7	9.1
Learning about students' learning needs	22	2.95(0.89)	0.0	31.8	50.0	9.1	9.1
Assigning academic tasks to students	22	2.68(0.99)	9.1	36.4	36.4	13.6	4.5
Classroom activity management	22	2.68(1.17)	13.6	31.8	40.9	0.0	13.6
Classroom time management	22	2.23(0.97)	22.7	40.9	31.8	0.0	4.5
Managing students' behaviour	22	2.36(1.00)	18.2	40.9	31.8	4.5	4.5
Paying equal attention to students	22	3.14(0.88)	0.0	27.3	36.4	31.8	4.5
Classroom decision making	22	3.05(0.95)	0.0	31.8	40.9	18.2	9.1
Following up with students' activities	22	2.45(0.96)	13.6	40.9	36.4	4.5	4.5
Learning about interactions between teacher and students	22	2.32(0.94)	22.7	31.8	36.4	9.1	0.0
Creating collaboration in the classroom	22	2.23(0.81)	18.2	45.5	31.8	4.5	0.0
Bringing about student learning and understanding	22	2.57(0.67)	4.8	38.1	52.4	4.8	0.0
Encouraging creativity in classroom activities	22	2.55(0.80)	4.5	50.0	31.8	13.6	0.0
Keeping students' engaged in classroom activities	22	3.00(1.18)	14.3	14.3	38.1	23.8	9.5
Enhancing students' motivation and interest in class activities	22	2.77(097)	9.1	27.3	45.5	13.6	4.5
Rewarding students appropriately	22	2.82(1.00)	4.5	36.4	40.9	9.1	9.1
Punishing students appropriately	22	2.86(0.99)	4.5	31.8	45.5	9.1	9.1

* The question was: "Please rate the effectiveness of simSchool for improving the following skills in classroom teaching."
** Based on a five-point scale: 1= Very poor; 5= Excellent

Items rated as lowest were 'Classroom time management' (mean=2.23), 'Creating collaboration in the classroom' (mean=2.23)', and 'Learning about interactions between teacher and students' (mean=2.32). This is not surprising since the simulation does not include practice of these skills. simSchool uses a teacher-directed model in which the teacher interacts with either one student or the whole class.

Ratings of simSchool as an Educational Software

Table 6 reports on the participants' ratings of different factors involved in evaluation of simSchool simulation as a piece of educational software. The simSchool aspects most often rated as good were 'It is free of racial, ethnic, and gender stereotypes' (mean=3.55), 'Graphics, color and sound are used for appropriate instructional reasons' (mean=3.23), 'Content has educational value' (mean=3.14), and 'It has clear purpose' (mean=3.05).

Table 6. Ratings of Aspects of simSchool*

	n	Mean (sd)**	Very Poor (%)	Poor (%)	Good (%)	Very Good (%)	Excellent (%)
Content has educational value	22	3.14(0.83)	4.5	9.1	59.1	22.7	4.5
Effectively stimulates my creativity	22	2.41(1.00)	22.7	27.3	36.4	13.6	0.0
Covers key concepts of classroom management	21	2.95(0.80)	4.8	14.3	66.7	9.5	4.8
Matches with my previous experiences	22	2.50(1.10)	18.2	36.4	27.3	13.6	4.5
Is generalizable to an appropriate range of situations	22	2.77(0.86)	13.6	9.1	63.6	13.6	0.0
Is motivational to use	22	2.77(0.92)	4.5	36.4	40.9	13.6	4.5
Is easy for me to use	22	2.50(0.96)	9.1	50.0	27.3	9.1	4.5
I could use it without help	22	2.91(1.15)	9.1	31.8	27.3	22.7	9.1
Is flexible for different users	22	2.64(0.90)	4.5	45.5	36.4	9.1	4.5
It has a clear purpose	22	3.05(0.78)	0.0	22.7	54.5	18.2	4.5
I find it fun	22	2.73(0.98)	9.1	31.8	40.9	13.6	4.5
It is free of racial, ethnic, and gender stereotypes	22	3.55(1.01)	4.5	4.5	40.9	31.8	18.2
Feedback on student responses is effectively employed	22	2.36(0.90)	13.6	50.0	22.7	13.6	100.0
Graphics, color and sound are used for appropriate instructional reasons	22	3.23(0.81)	0.0	18.2	45.5	31.8	4.5
It gives me control over the rate and the sequence of the simulation	22	2.82(1.00)	13.6	13.6	54.5	13.6	4.5

* The question was: Please rate the following aspects of simSchool
** Based on a five-point scale: 1= Very poor; 5= Excellent

The aspects of simSchool as a piece of educational software that were rated lowest were 'Feedback on student responses is effectively employed' (mean=2.36), 'Effectively stimulates my creativity' (mean=2.41), 'Matches with my previous experiences' (mean=2.50), and 'Is easy for me to use' (mean=2.50).

Effects of simSchool on Participants

Table 7 reports working with simSchool simulation from three different perspectives. More than three quarters of participants reported no change in their skills as a result of using simulation. However, almost a quarter (22.7%) reported that their skills had increased, and none reported a decrease.

Table 7. Participants' Ratings of simSchool's Effects on Them*

	N	Increased (%)	No change (%)	Decreased (%)
Skills	22	22.7	77.3	0.0
Knowledge	22	40.9	59.1	0.0
Confidence	22	13.6	68.2	18.2

* The question was: "Please rate simSchool with regard to its effect on you in the following areas:"

A similar finding occurred with respect to confidence. More than two thirds (68.6%) of participants indicated no change in their confidence, yet 40.9% reported an increase in their knowledge as a result of working with the simulation. Slightly more than 18% reported a decrease in their confidence, while 13.6% reported an increase.

Despite the short time spent working with the simulation, it is notable that more than 40% of students reported an increase in their knowledge, and almost a quarter reported an increase in their skills. More than two-thirds did not feel that their confidence had changed, and this might be expected since they did not practice with real students.

4.2. Open-ended Survey Questions

1. What did you like most about simSchool?

Theme 1: *Opportunity to practice different classroom situations before real classroom teaching experience (n=7)*

Student teachers commented in different ways with their satisfaction that the simSchool simulation provides the opportunity to practice different classroom situations before real classroom teaching experience. Examples of these comments include the following:

- *"Interesting simulations. Good for use 'before' practicum….to help imagine what a classroom might be like."*
- *"Gets me forward, thinking about what students will need, how to keep students behaving or engaged on task when almost finished, etc."*
- *"….Gave me a sense of 'reasonable exposure' to classroom experiences."*
- *"I liked that it did give you an opportunity to try to work through issues that could come up in a class."*
- *"Fun way to learn about classroom management with students' attitudes and performance in school."*
- *"I liked that I could deal with a situation with the click of a button.*
- *Giving virtual practice before going into a classroom. Presenting various behaviours present in students."*

Theme 2: *An interesting and fun activity (n=3)*

Student teachers commented in different ways on finding simSchool fun and interesting. The examples of these comments are as below:

- *"It is an interesting program, charting the development and change in students' behaviour, depending on your actions. Similar to new videogames where the story changes based on what you do. I think mass effect is an example of this."*
- *"fun activity,…"*
- *"Fun"*

Theme 3: *Variety of options for interaction and having conversation with simStudents (n=5)*

Student teachers commented in different ways on their satisfaction with the options for interaction and conversation with simStudents:

- *"…I still liked having the option of saying/interacting with the students to try and get my point across"*
- *"The variety of 'assertations' and 'observation' comments provided."*
- *"The detailed student profiles and range of activities."*
- *"There were lots of choices and they were categorized well."*

Theme 4: *Feedback of the simulation in the form of final results (n=4)*

Student teachers reflected on their satisfaction with the feedback provided by simSchool in different ways. Examples of these comments are provided below:

- *"Love the spreadsheets and datagraph (very clear and easy to understand) especially when doing comparing and contrast."*
- *"The program tried to give very detailed feedback on the effects of my choices in the classroom."*
- *"The charts and graphs at the end of the simulation are helpful,… they made more sense as more round of simulations were completed."*
- *"I liked to compare achievements/agreeableness charts (not the source!)"*

Theme 5: *Variety in responses and attitudes of simStudents and the change and development of their academic performance (n=5)*

Student teachers reflected in different ways their statisfaction with the responses and attitudes of simStudents. Examples of these ideas are provided below:

-*"Presentation of different factors that can effect students' academic performance"*
-*"I liked that the students would show immediate response to the actions employed by the teacher."*
- *"Learning how certain factors can affect students' academic performance"*
-*"…Charting the development and change in students' behaviour, depending on your actions"*
- *"Students attitudes were quite realistic"*

2. What did you like least about simSchool?

Theme 1: *Inappropriate/limited/unrealistic options for conversation/interaction with simStudents (n=12)*

Student teachers reflected their dislike of the options for conversational interaction with simStudents in a variety of ways. Several examples of these comments are provided below:

- *"The comments options. Some of them were entirely inappropriate. I would never say them to a student."*
- *"The options were hard to find and do not necessarily fit the response we seek to give to students."*
- *"Limited options for what you can say, or how to set up a lesson, such as explaining an assignment."*
- *"Limited selection of things I could do"*
- *"How we could not type our own responses"*
- *"It completely lacked any human feelings to it, and seemed distanced from reality and unrealistic."*
- *"I found the comments difficult to use. I could not always find the comment that I wanted to use or it would take time trying to find the comment that best fit the situation at hand."*
- *"…it was hard to find the right thing that I wanted to say before student had already moved on."*
- *"Restricted to what I could do or say to students."*
- *"There are some choices, I did not see what I wanted to say."*
- *"The categorization of the speech bubbles, it was difficult to locate the specific comments that I want to send."*
- *"Navigation for options/activities were unclear, hard to locate what you want to find, how you would want to respond to the student."*

Theme 2: *Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents (n=9)*

Student teachers provided opinions on the difficulty of navigating the simSchool interface in different ways. Examples of these comments are below:

- "The options were hard to find and do not necessarily fit the response we seek to give to students."
- "The mechanics of it! Couldn't find the right tasks and questions in time."
- "Interface is difficult to use
- "Difficulty of navigation between levels of menus for different actions, not relating to my teaching style."
- "I found the comments difficult to use. I could not always find the comment that I wanted to use or it would take time trying to find the comment that best fit the situation at hand."
-"That it was hard to find the right thing that I wanted to say before student had already moved on."
- "… it was hard to ... find the particular actions/vocal that I wanted to put into action.
- Hard to navigate"
- "Navigation for options/activities were unclear, hard to locate what you want to find, how you would want to respond to the student."

Theme 3: *Difficulty of use (n=3)*

Student teachers reflected on finding simSchool difficult in different ways. Examples of these comments are provided below:

- *"It was a bit difficult for me to use it if I accidently pushed the wrong button/command."*
- *"It was really hard to follow up with all the students, It was hard trying to understand their different personalities."*
- *"How we could not type our own responses …"*

Theme 4: *simStudents' responses to the chosen tasks/conversation options did not seem to suit or make sense (n=5)*

Student teachers commented in different ways on finding the simStudents' responses unsuitable or nonsensical. Examples of these comments are provided below:

- *"Student responses were weird."*
- *"…How responses to the students' gave did not reflect what was said."*
-*" That the kids responses rarely made sense in terms of what you say to them".*
- *"…I tried really hard, but was discouraged when the students were still unruly"*

3. Please provide any suggestions you have for improving simSchool and/or its use with student teachers:

Theme 1 : *Having a clearer, more user-friendly and ordered categorization of comments in the interface for navigation and interaction with simStudents (n=9)*

Student teachers suggested that the interface would be improved by differently categorizing the choices for interacting with simStudents. Examples of these suggestions are as follows:

- *"It is difficult to recall what responses fall under what categories …."*
- *"… make it easier to see the questions being asked by students and by teachers."*
- *"…Make the layout more user-friendly."*
- *"It would be great if the options for activities and speech were in drop-down list format, so you could see all at once instead of having to scroll them."*

- *"I would have the comments link/button be a drop menu so you could see the whole category at once."*
- *"If the speech boxes could branch out for easier access that would make the simulation easier to use…."*
- *"Make navigation simpler"*
- *"Change the interface for the commands, I found it difficult to choose exactly what I wanted to say."*

Theme 2: *Allowing users to create their original comments for interaction with simStudents (n=5)*

Student teachers also offered suggestions for improving simSchool by allowing student teachers to interact with students in different ways. Although this desire is understandable, it is unrealistic. Examples of these comments are as below:

- *"Allow users to create individual/original comments."*
- *"Being able to add own comments, rather than pre-determined responses.*
-*"I also think it would have been nice to have a text box to fill in what I may want to say because the responses are so limited and hard to find."*
- *"Providing opportunity to type in what I would want to say or do."*
- *"If it is possible, add your own commands"*
- *"… there are simply too many complex interactions that take place in teaching a class to model reality, authentically or effectively."*

These suggestions would require the system to do very sophisticated natural language processing, which would make it impossible for it to work in real time.

Theme 3: *Allowing more realistic options for variety of interactions, conversations and teaching styles (n=6)*

Student teachers offered suggestions for allowing more realistic options for interaction and conversation with simStudents in different ways. Examples of these suggestions are as follows:

- *"I suggest more options with interacting (like allowing us to ask a greater variety of questions."*
- *"Not all lessons and activities exist and neither does the personality/skills of the teacher. I am not sure how this could be fixed as it would take a lot of work, but it would be a great addition.*

This means that the students will always respond the same way to a task regardless of the potential interest in differing context. What the program does is showing the importance of varying instructional strategies by ignoring content and style."
- "Perhaps having a realistic class of students for BC (i.e.: ESL learners, autistic, etc.)
- More realistic prompts for assigning activities and responding to students."
- "… there are simply too many complex interactions that take place in teaching a class to model reality, authentically or effectively."
- "Have student responses/interactions more genuine"

4.3 Performance Results

The tables below present student teacher performance statistics generated by the simSchool simulation at the end of each round of the data collection.

The task appropriateness score indicates how well the task assigned to a simStudent was matched with the characteristics of that simStudent, and the learning score indicates how much the efforts of the user as the teacher have resulted in the simStudents learning. It should be noted that despite this researcher's efforts in searching through the simSchool manual handbook and the simSchool website, and contacting the simSchool developers, it was not possible to find any description of the scale, or the maximum and minimum scores on these dimensions of performance as calculated by simSchool.

Table 8. Paired tests between Practice and Actual session of working with one simStudent (n=22)

Variable	Practice session Mean (sd)	Actual Session: 1 simStudent Mean (sd)	t	p
Task appropriateness	375.8 (288.4)	370.2 (290.6)	0.06	0.950
Learning Score	479.6 (159.4)	686.8 (83.3)	5.86	0.001

Table 9. Paired tests between working with one simStudent and five simStudents (n=22)

Variable	Actual Session: 1 simStudent Mean (sd)	Actual Session: 5 simStudents Mean (sd)	t	p
Task appropriateness	370.2 (290.5)	613.7(208.9)	4.28	0.001
Learning Score	686.8(83.2)	553.2(121.2)	5.30	0.001

The first table shows the paired t-test results on task appropriateness and learning score between the practice session (first round of the experiment) and the actual session (second round of the experiment). As can be seen in this table, the participants' Learning Scores increased significantly from the first session (mean=479.6) to the second (mean=686.8) while

working with one simStudent. This shows that the participants' performance improved significantly after working with the simSchool simulation in the practice round of the experiment. However, as working with five simStudents was more challenging for participants, increasing the number of simStudents from one to five simStudents resulted in a decrease in the learning scores of the participants.

On the other hand, the tables show that the task appropriateness scores remained almost the same in the first table; however, it increased significantly in the second table. According to the participants' answers related to the interface of simSchool, the absence of change in the task appropriateness score in working with one simStudent (first table) may be an indicator of the difficulty of matching the appropriate task to simStudents of different characteristics, while the improvement in their score for task appropriateness in the second table may be the indicator of the effect of improvement in the performance of participants through practice.

4.4 Overall Analysis of the Survey Results

Overall, the participants' ratings of the aspects of simSchool suggest several things. In reference to the realism of simSchool's features (Table 4), many student teacher participants found simSchool realistic in representing the challenges of a typical teacher in the classroom (mean=3.73). As was discussed before, the user of simSchool (as the teacher of the simStudents) has various challenges and responsibilities, such as paying attention to different simStudents' characteristics, choosing appropriate conversation options matched with simStudents' personalities, improving the simStudents' performances in various academic tasks, and keeping simStudents happy and motivated through different class activities. These challenges are similar to the challenges of a typical teacher in the real classroom, as discussed in Chapter 2.

The second feature of simSchool which was rated highly as realistic by student teacher participants was the simStudents' individual profiles (mean=3.71). As was mentioned above, each simStudent in simSchool has a unique profile in the teachers' laptop, and at any time during working with simStudents the user as the teacher can refer to the simClass roster and read the simStudents' profiles in order to be able to choose the appropriate academic task and dialogue matched with each simStudent's characteristics. As can be seen in Figure 1, each simStudent's profile includes information about the simStudent's personality, academics and teacher's reflections, which are all similar to the real profiles of elementary students that are noted in records by elementary school teachers.

The third simSchool feature which was rated highly realistic by student teacher participants was the characteristics of simStudents compared to the characteristics of real high school students (mean=3.27). Each simStudent in simSchool has a range of characteristics, and the simStudents have different dimensions to their personalities. As described in the simSchool manual, each simStudent in the simClass has an individual personality with settings on six dimensions: 1) expected academic performance, 2) openness to learning, 3) conscientiousness toward tasks, 4) extroversion or introversion, 5) agreeableness, and 6) emotional stability. These settings range from very negative to very positive on each dimension, with about 20 different possible points on each of the six dimensions. This wide range of personalities and characteristics is similar to that of students in a real classroom.

The feature of the simSchool rated as least realistic (mean=2.23) by student teacher participants was the conversation between the user as the teacher and the simStudents. This low rating was also very consistent with the themes created from the analysis of the student teachers' respononses to the open-ended questions in the survey, where participants strongly addressed the unrealistic options provided by the simulation for conversation and interaction with simStudents.

In reference to the participants' ratings of simSchool's effectiveness (Table 5), many student teacher participants found working with simSchool an effective way to learn about different students' characteristics (mean=3.14). As mentioned before, one of the significant characteristics of an effective educational simulation is provision of realistic representation of the actual learning environment in the simulated model.

The data indicate that student teachers' impressions of simSchool were consistent with their ideas about the characteristics of real high school students (mean=3.27).

The other aspect of simSchool which was rated highly effective by student teacher participants was learning about classroom decision-making (mean=3.05). As described previously in Chapter 2, one of the significant advantages of using educational simulations for teacher preparation is the opportunity of practicing classroom decision-making in a safe environment. This high rating was consistent with the themes created from the analysis of student teachers' responses to the first open-ended question of the survey, where they reflected on the opportunity to practice different classroom situations before real classroom teaching experience (n=7).

The aspects of simSchool which were not rated highly effective by the student teacher participants were learning about classroom time management (mean=2.23), creating collaboration in the classroom (mean=2.23), interactions between the teacher and students (mean=2.32), and managing students behaviours (mean=2.36). The explanation for the low ratings of these aspects of learning from simSchool could be the difficulty of finding, in the simSchool interface, the appropriate response to simStudents.

Through the themes created from the analysis of student teacher participants' responses to the open-ended questions on the survey, it can be seen that overall, the student teacher participants found simSchool a fun and interesting activity and appreciated the opportunity to practice with simSchool through various classroom situations before their real teaching experience. They also liked the the variety of options for interaction and conversation with

simStudents, and the feedback the simulation provided in the forms of final results, Excel spread sheets, and learning progress of the simStudents.

However, overall, the student teacher participants found simSchool difficult to use, specifically to navigate through the tasks and conversation options. Moreover, student teacher participants did not find simSchool very effective in representing a realistic conversation and dialogue between students and teachers. Some of the student teacher participants in this study also found simStudents' responses negative or unrealistic.

These responses were consistent with the student teacher participants' suggestions on improving simSchool by improving the design of its interface and making it more clear and user-friendly, as well as having a better categorization of comments to ease navigation through interactions with simStudents. They are also consistent with suggestions to allow original comments in order to be able to better interact with simStudents.

4.5 Discussion of Findings

Even though working with a model like simSchool as a simulation for teacher education cannot replace the experience of teaching in real classrooms for pre-service teachers, the affordances of such models offer benefits for learning. One of the benefits of working with simulations like simSchool is shearing away details in a simplification of a real system. Working with simulations like simSchool provides the opportunity of experiencing some aspects of a real system that cannot otherwise be experienced. A simulated classroom like simSchool provides cycles of experimentation and practice with few of the dangers associated with mistakes made on real students in real classrooms.

My evaluation of simSchool as an online simulation for teacher education also showed that overall, the student teachers found simSchool an instructional program possessed of educational value that can enhance the knowledge of classroom teaching for student teachers. Although some features of simSchool still need to be improved to meet and fulfill student

teachers' perceived needs, many aspects of working with this simulation may be effective for learning about classroom teaching for pre-service teachers.

Some of the key findings of this study of simSchool include:

- Practicing with educational simulations like simSchool increases participants' self-reported knowledge and skills, but not their confidence. Receiving feedback and having the opportunity of seeing and comparing the results of performance in educational simulations like simSchool is a feature that is much appreciated by participants.
- Participants prefer higher-fidelity educational simulations that represent a more realistic model of the actual learning environment. Having a user-friendly and clear interface that allows smooth and easy navigation for targeted learners in educational simulations like simSchool can facilitate working with the simulation, and enhances the learners' performance.

These findings should be valuable as they have been established through the actual reflections, performance and feedback of student teachers – the main target users of simSchool.

These findings may also help the developers of educational simulations like simSchool specify the gaps, strong and weak points of such programs, and enhance the quality of their current and future products by considering the perceived needs and feedback of student teachers as the main users of these instructional programs. This may ultimately lead to improvement in the quality of education for the future teachers, and help them in becoming more prepared and better educated for their actual classroom teaching experience. This would eventually lead to significant improvement in the quality of education for the prospective students who would benefit from well-educated teachers.

4.6. Limitations of the Study

Although this study has tried to cover many aspects and standards of instructional design and teacher education principles in evaluating simSchool as an educational simulation for pre-service teachers, further research is needed in order to better evaluate this software, and to understand how to improve its effectiveness for the education of prospective teachers.

One of the limitations of this study was the short time-frame for conducting the experiment. As described above, the participants for this study were student teachers in the Professional Development Program (PDP) at Simon Fraser University (SFU). The data collection for each participant was carried out over a single session, due to the restricted availability of the student teachers. The student teacher participants could only work with the simSchool simulation during the specified session of the experiment for which they were registered. Therefore, student teacher participants worked with simSchool in three rounds (practice, working with one student and working with five students) on the day for which they had signed up earlier.

Also, the free version of the simSchool which was available online for use at the time of the study allowed users to choose only one or five simStudents, and as learning to work with even one or five simStudent required a sufficient practice time for the PDP students of this study, there was no more time for conducting the experiment with a full class of eighteen simStudents.It is also important to note that self-report was the main source of data in the data collection phase.

Finally, the sample of students involved in the study might be considered biased, because it involved willing volunteer student teachers (primarily female), and not a randomly-selected sample. Therefore, the generalizability of the results is limited.

4.7 Further Research

The results of this study suggest several areas for further study, including the following: (1) More time for using simSchool and practicing with a classroom of 18 simStudents; (2) Studying how simSchool could be integrated into a regular teacher education program; (3) Using a larger sample of student teacher participants at different stages of progress through the program (e.g., PDP student teachers in their first semester starting their program, and PDP student teachers in their last semester finishing their PDP program). This can be effective for the evaluation of teacher education programs like simSchool, as there would be a clear categorization among the participants based on their prior knowledge and experience, which can help analyzing the effects of working with educational simulations through their performances in the study; (4) Extending the study to examine the effects of practicing with simSchool simulation on student teachers' performance in actual classrooms. As was mentioned above, in evaluating simSchool as an educational simulation for pre-service teachers, only the first two levels of Kirkpatrick's four-level training evaluation model have been considered in the present study (i.e., reaction and learning). However, the third and fourth levels of Kirkpatrick's model (behaviour and results) could not be examined due to limitations of time and resources. Evaluating the effects of working with simSchool through these latter evaluation levels requires examining the impacts of working with this program on the teaching experience of student teachers' in real classrooms.

5 Conclusions

The main objective of this research was to evaluate simSchool as an online simulation for teacher education. The first key question that this study sought to explore was:

Can simSchool help student teachers on their way to authentic classroom teaching experiences?

A definitive answer to this question requires a prolonged study and a longer-term evaluation that provides the opportunity of examining the effects of working with simSchool simulation on the actual classroom teaching experience of student teachers. Due to the time limitations of this study, examining the effectiveness of working with simSchool on the real classroom teaching experience of student teachers was not feasible. However, we can tentatively answer this question based on the scores and the reflections of student teachers themselves on working with simSchool simulation.

Referring to Table 4 in Chapter 4 of this thesis, it can be clearly seen that overall, the student teacher participants rated simSchool as a helpful tool for learning about classroom teaching. Student teachers' ratings of the realism of simSchool in Table 4 show that the participants found the simStudents' profiles, and the challenges of a typical teacher represented in simSchool to be realistic. This result indicates that, although simSchool may not be a thorough representation of a real classroom, it certainly includes the representation of some key and significant elements of classroom teaching.

Ratings and answers of student teachers to the quantitative and qualitative questions in the survey questionnaire also confirms these findings, and show that on average, the simSchool simulation has been relatively sucessful in demonstrating some important elements of the classroom teaching experience for pre-service teachers.

As Table 5 in Chapter 4 also illustrates, many student teachers gave a ‘good’ rating for the effectiveness of simSchool on their learning about the various aspects of classroom teaching.

The results of the survey showed that the student teachers found the simSchool simulation effective in learning about the real classroom teaching experience. The student teachers’ ratings of the simSchool simulation suggested that it has been a useful tool in helping them learn about the variety of students’ characteristics and personalities, as well as the need to pay equal attention to students with different learning needs.

This can also be seen in Table 7, which shows participants’ ratings of the effects of simSchool on them. Almost half of the student teacher participants reported an increase in their knowledge of classroom teaching, and more than half of them indicated as well that they rated the simSchool simulation as having educational value.

In addition, there were a number of themes created from the answers of student teacher participants on the three open-ended questions at the end of the simSchool survey. One of the most significant themes appearing in the participants’ answers to the first open-ended question (which asked about the aspects of working with simSchool that participants liked most) was the opportunity to practice that simSchool brings about through presenting different classroom situations before student teachers’ actual classroom teaching experience.

Many of the student teachers indicated that they find working with simSchool simulation useful for preparing and practicing before starting teaching in real classroom settings. Others stated that working with simSchool gives them the opportunity of thinking and imagining about different situations and scenarios that may happen in real classroom teaching experience.

The analysis of participants’ scores generated at the end of each round of working with the simSchool (in the form of the learning scores and the task appropriateness scores generated by the software itself) confims these findings and showed that the overall performance of student teacher participants improved through practice with the simulation.

In conclusion, overall the analysis of quantitative and qualitative responses of student teacher participants showed that although simSchool as an educational online simulation still has some flaws and cannot be relied on as a replacement for traditional teacher education practices such as practica, it can certainly help student teachers on their way to become better prepared for the authentic classroom teaching experience.

The second question that this research sought to explore was:

How do student teachers rate simSchool as a teacher preparation tool?

As was described earlier, simSchool is currently one of the very few software programs designed for the purpose of teacher education. Therefore, the opinions and the feedback of student teachers on working with it as the main users of this program was very valuable.

The survey questionnaire for this research was designed with very detailed questions in order to cover various aspects of evaluating simSchool as a teacher preparation tool. The survey questionnaire in this study sought the opinions of student teachers on working with simSchool both as an online simulation software and as an instructional tool in preparing them for real classroom teaching experience.

According to the analysis of the participants' answers in the survey questionnaire, many student teachers found simSchool a helpful online simulation with educational value that provides them with an opportunity to practice by representation of various classroom situations through a fun and engaging activity.

Many student teachers rated simSchool as an effective simulation for learning about different aspects of classroom teaching experience and stated that the graphics and the colors used in simSchool were designed for appropriate instructional purposes, and that the simulation had a clear instructional purpose.

While many of the student teacher participants found the feedback of the simSchool simulation and the variety of options for interaction and conversation with simStudents useful, many of them stated that the conversation and dialogue between the teacher and the

simStudents, as well as the feedback of the simulation in the form of simStudents' responses, were not realistic.

Many student teachers provided opinions about the feedback employed by simSchool and the responses provided by the simulation to their classroom decision-making. One of the opinions common among them as the most liked aspect of simSchool was the feedback of the simSchool simulation in the form of final results (i.e: the graphic diagrams and the Excel spread sheets generated by the program) as well as the progress of their academic performance as a result of change in the teacher's choice.

However, there were also some aspects of simSchool simulation that were rated as poor by student teacher participants, such as the 'options for assigning academic tasks to simStudents' and 'the conversation between the user as a teacher and simStudents'. The other aspects of simSchool which were rated as poor were 'learning about creating collaboration in the classroom' and 'classroom time management'.

In conclusion, according to the opinions of student teachers participating in this study, although there are some aspects and features of simSchool that require improvement in order to meet the needs of student teachers thoroughly, simSchool is an interesting program with educational value that helps them to become prepared for classroom teaching.

The third key question of this study was:

What do student teachers see as the strengths and weaknesses of simSchool?

According to the ratings and opinions of student teachers on different aspects of simSchool, one of the most-liked aspects was the opportunity to practice before real classroom teaching. Many student teachers explained that they found working with simSchool a fun way to learn about classroom management and about the issues and situations that may come up in a real classroom situation. One of the other features of simSchool that was frequently rated as strong was the variety of the options for interaction and conversation with simStudents in simSchool. Many student teachers maintained that they liked having a variety of options for

interacting with simStudents and assigning academic tasks to them, and many of them also maintained that the simSchool simulation was free of racial, ethnic, and gender stereotypes.

The other features of simSchool that were rated highly by student teachers were the detailed profiles of simStudents, challenges of a typical teacher represented in simSchool, the feedback of the simSchool in the form of final results, and the opportunity of learning about different characteristics of students and the factors that can affect students' academic performance.

Student teachers' answers and ratings of different aspects of simSchool reflected the weak points of this simulation as well. Student teacher participants rated simSchool very poor from the perspective of bringing about creativity, learning about creating collaboration in the classroom, and classroom time management. The student teachers' answers about the least-liked features of simSchool also showed that most of the student teachers found the options for conversation and interaction with simStudents in simSchool inappropriate and unrealistic. The student teachers also maintained that they found it difficult to work with the simulation, specifically with navigation and using the options of designed for interaction and having conversation with simStudents. The majority of student teachers also maintained that the simStudents responses were negative and unrealistic.

Finally the last research question was:

What features of simSchool are required to be improved in order to meet student teachers' preparation needs?

The majority of student teacher participants suggested having a more user-friendly and ordered categorization of comments for interaction with simStudents in the simSchool interface. Most of the student teacher participants found it difficult to recall the location of each comment in the categorization of available options for interaction with simStudents. Some of the student teachers also suggested on having a drop-down menu that would allow having a larger scope of available options for interaction and conversation with simStudents without having to return to

the main menu of options. The other common theme created from the suggestions of student teachers' responses was their suggestion for simSchool to allow the creation of users' original comments for interaction with simStudents. Many of the student teachers mentioned that it would have been better if the simulation allowed them to fill in a dialog box with their own original comments for interaction with simStudents.

The other common suggestions among student teachers were having more realistic options for a variety of interactions and conversations with simStudents. Many student teachers suggested having a larger range of realistic comments for different situations and for different teaching contexts. The other common suggestion among student teachers was having simStudents' behaviour in the classroom more appropriately matched with teachers' actions and statements.

6 Appendices

Appendix A: Pilot Study

Table 1: Participants' Background *

Item	Frequency
CURRENT COURSE (n=0)	
Educ 401/2	0
Educ 405	0
Educ 404	0
Other	0
BEGINNING SEMESTER (n=0)	
Fall	0
Spring	0
TEACHING FOCUS (n=5)	
Elementary	1
Secondary	4
GENDER (n=5)	
Male	2
Female	3
COMPUTER SKILL (n=5)	
Novice	1
Intermediate	3
Proficient	1
USED COMPUTER-BASED SIM FOR EDUCATION (n=5)	
No	3
Yes	2
USED COMPUTER-BASED SIM FOR OTHER CONTEXT (n=5)	
No	2
Yes	3
PLAN TO USE SIMULATION STRATEGIES IN CLASSROOM (n=4)	
No	1
Yes	0
Not Sure	3

* The question was: “Please choose the appropriate option for each question.”

Four out of the total of five pilot study participants indicated that their teaching focus was at Elementary level. Three out of the five pilot study participants were female and also three out of five of them indicated their computer skill as intermediate. Most of the participants of pilot study had used computer-based simulation in contexts other than education. Finally, three out

of the total five pilot study participants indicated that they were not sure whether they wanted to use simulation strategies in classroom in the future.

Pilot study participants spent about 90 minutes in average on working with simSchool simulation (with 40 minutes being the minimum and 120 minutes being the maximum time they spent on working with simSchool simulation).

Table 2: Participants' Ratings on Realism of simSchool Features*

	N	Mean(sd)**	Very Realistic	Unrealistic	Unsure	Realistic	Very Realistic
The characteristics of simStudents compared to the characteristics of real highschool students	5	3.80(0.44)	0	0	1	4	0
Students' profiles	5	4.0(0.0)	0	0	0	4	0
The design of the simSchool classroom compared to a real classroom situation	5	3.6(0.89)	0	0	3	1	1
simStudents' behaviour	5	3.40(0.54)	0	0	3	2	0
The outcome of simStudents' academic performance	5	3.40(0.54)	0	0	3	2	0
Conversations between you as a teacher and simStudents	5	3.4(.89)	0	1	1	3	0
Options for assigning academic tasks to simStudents	5	3.2(0.83)	0	0	1	2	0
Teachers' challenges represented in simSchool	5	3.4(0.89)	0	1	1	3	0

* The question was: "How realistic did you find the following features of simSchool:"
** Based on a five-point scale: 1= very unrealistic; 5= very realistic.

Among pilot study participants almost no students found these features of simSchool as unrealistic or very unrealistic. Results were reasonably aligned with the results from the main experiment. The pilot study showed the feasibility of doing the study and helped in testing the questionnaire, running the experiment and testing the procedures to be used later in the experiment with the main participants.

The results from the pilot study also confirmed that participants require enough time working with the simulation, as one of the participants who worked with the simulation for less than an hour (40 minutes) could not evaluate the simSchool features as effectively as others.

Table 3: Participants' Ratings of simSchool Effectiveness*

	n	Mean (sd)**	Very Poor	Poor	Good	Very Good	Excellent
Learning about different student characteristics	5	3.60(0.54)	0	0	2	3	0
Learning about students' learning needs	5	3.20(0.83)	0	1	2	2	0
Assigning academic tasks to students	5	3.60(0.89)	0	0	3	1	1
Classroom activity management	5	3.80(0.83)	0	0	2	2	1
Classroom time management	5	3.00(0.70)	0	1	3	1	0
Managing students' behaviour	5	3.00(0.81)	0	1	2	1	0
Paying equal attention to students	4	2.80(0.44)	0	1	4	0	0
Classroom decision making	5	3.40(0.54)	0	0	3	2	0
Following up with students' activities	5	3.40(1.14)	0.0	1	2	1	1
Learning about interactions between teacher and students	5	3.20(0.83)	0.0	1	2	2	0
Creating collaboration in the classroom	5	2.80(0.83)	1	2	2	1	0
Bringing about student learning and understanding	5	2.80(0.44)	0	1	4	0	0
Encouraging creativity in classroom activities	5	3.40(0.54)	0	0	3	2	0
Keeping students' engaged in classroom activities	5	2.60(0.54)	0	2	3	0	0
Enhancing students' motivation and interest in class activities	5	3.00(0.70)	0	1	3	1	0
Rewarding students appropriately	5	3.40(1.14)	0	1	2	1	1
Punishing students appropriately	4	3.00(0.81)	0	1	2	1	0

* Please rate the effectiveness of simSchool for improving the following skills in classroom teaching
** Based on a five-point scale: 1= Very poor; 5= Excellent

Most of the pilot study participants rated the effectiveness of simSchool on their learning about different aspects of classroom teaching as "good" (thirteen out of the total of seventeen aspects of effectiveness of simSchool).

Table 4: Ratings of Aspects of simSchool*

	n	Mean(sd)**	Very Poor	Poor	Good	Very Good	Excellent
Content has educational value	5	3.40(0.54)	0	0	3	2	0
Effectively stimulates my creativity	5	3.20(1.09)	0	1	3	0	1
Covers key concepts of classroom management	5	3.60(0.89)	0	0	3	1	1
Matches with my previous experiences	4	2.70(0.95)	0	2	1	1	0
Is generalizable to an appropriate range of situations	4	3.50(1.00)	0	0	3	0	1
Is motivational to use	5	3.40(0.54)	0	0	3	2	0
Is easy for me to use	5	2.80(1.30)	0	3	1	0	1
I could use it without help	4	2.50(1.00)	0	1	3	1	0
Is flexible for different users	5	3.00(0.70)	0	1	3	1	0
It has a clear purpose	5	3.40(0.89)	0	1	3	0	1
I find it fun	5	3.00(0.00)	0	0	5	0	0
It is free of racial, ethnic, and gender stereotypes	5	3.40(1.14)	0	1	1	1	1
Feedback on student responses is effectively employed	4	3.25(0.50)	0	0	3	1	0
Graphics, color and sound are used for appropriate instructional reasons	4	3.00(0.81)	0	1	2	1	0
It gives me control over the rate and the sequence of the simulation	5	3.00(0.70)	0	1	3	1	0

* The question was: “Please rate the following aspects of simSchool:”
** Based on a five-point scale: 1= Very poor; 5= Excellent

Most of pilot study participants rated different aspects of simSchool simulation (ten out of the total fourteen aspects of simSchool) as good, with ratings of the item ‘covers key concepts of classroom management, as rated as highest (mean=3.60).

Table 5: Participants' Ratings of simSchool's Effects on Them*

	n	Increased	No change	Decreased
Skills	5	2	3	0
Knowledge	5	5	0	0
Confidence	5	2	3	0

* The question was: "Please rate simSchool with regard to its effect on you in the following areas:"

Three out of the five pilot study participants indicated no change in their skills as a result of working with simSchool simulation. Similar findings occurred with three out of the total five participants indicating no change in their confidence. However, all of the pilot study participants indicated increase in their knowledge as a result of working with simSchool simulation.

Appendix B: Tables of Comments and Themes

1. What did you like most about simSchool?

Comment	Theme
1. Giving virtual practice before going into a classroom. Presenting various behaviours present in students.	Opportunity of practice through different classroom situations before real classroom teaching experience (Variety of) simStudents' characteristics
2. I liked the responses to my decision-making. - Stimulated reflections I liked to compare achievements/agreeableness charts (not the source!)	simStudents responds to the decisions and actions made by the teacher + Feedback and results of the game at the end + Comparing the results of each round of working with the simulation with that of the previous round
3. I'm not actually certain there was anything I liked. The setting was entirely unrealistic and the tests were unclear. There was no set lesson/topic and no room for creativity.	**-----**
4. Students attitudes were quite realistic	(realism of) simStudents attitudes
5. The ideas behind it, what the program is trying to achieve.	The idea of the simulation
6. It is an interesting program, charting the development and change in students' behaviour, depending on your actions. Similar to new videogames where the story changes based on what you do. I think mass effect is an example of this.	Being an interesting and fun activity, + (Presentation of change and development of behaviour in) simStudents' attitudes (depending on actions)
7. Even though communication between teachers and students wasn't effective, and didn't resemble real life, I still liked having the option of saying/interacting with the students to try and get my point across.	Variety of the options for interaction and having conversation with simStudents
8. Learning how certain factors can affect students' academic performance	Presentation of different factors that can effect students academic performance
9. The charts and graphs at the end of the simulation are helpful. They are also somewhat confusing, but they made more sense as more round of simulations were completed.	Results in the form of charts and diagrams. Practicing on different rounds of simulation
10. The program tried to give very detailed feedback on the effects of my choices in the classroom.	Feedback of the game in the form of results at the end (and through the game as well)
11. There were lots of choices and they were categorized well.	Variety of the options for interaction and having conversation with simStudents + the categorization of the options
12. Gets me forward, thinking about what students will need, how to keep students behaving or engaged on task when almost finished, etc.	Opportunity of practice through different classroom situations before real classroom teaching experience
13. I liked that I could deal with a situation with the click of a button.	Opportunity of practice through different classroom situations before real classroom teaching experience + Ease of use
14. I liked that it did give you an opportunity to try to work through issues that could come up in a class.	Opportunity of practice through different classroom situations before real classroom teaching experience

15. Fun activity, gave me a sense of 'reasonable exposure' to classroom experiences.	Being an interesting and fun activity + Opportunity of practice through different classroom situation before real classroom teaching experience
16. The detailed student profiles and range of activities. You can also choose different levels, and numbers of students. It was easy to use and understand.	Detailed simStudents' profiles + Variety of the options for interaction and having conversation with simStudents + Ease of use
17. Interesting simulations. Good for use "before" practicum….to help imagine what a classroom might be like.	Being an interesting and fun activity + Opportunity of practice through different classroom situation before real classroom teaching experience
18. Very straight forward and easy to use. - Fun way to learn about classroom management with students' attitudes and performance in school. - Love the spreadsheets and datagraph (very clear and easy to understand) especially when doing comparing and contrast.	Ease of use + Opportunity of practice through different classroom situations before real classroom teaching experience + Variety of the options for interaction and having conversation with simStudents + Feedback and results of the game at the end + Comparing the results of each round of working with the simulation with that of the previous round
19. I like the multicultural students that's presented in the simulation. The variety of "assertations" and "observation" comments provided.	(Variety of) simStudents' characteristics + Variety of the options for interaction and having conversation with simStudents
20. I liked that the students would show immediate response to the actions employed by the teacher.	simStudents responds to the decisions and actions made by the teacher
21. Fun	Being an interesting and fun activity
22. Pretty realistic although the simulation only represented a small percentage of the number of students are actually dealt with reality	**-----**
23 (P). It's a new game for me and it seems interesting and can trigger me to try it.	Being an interesting and fun activity
24 (P). It consists of many strategies in to handle many kinds of student 's portfolios	**-----**
25 (P). Each student has his/her own character.	(Variety of) simStudents' characteristics
26 (P). It consists of many strategies in the real classroom, and you can learn teaching, and how to manage classroom.	Opportunity of practice through different classroom situations before real classroom teaching experience + Presenting real classroom teaching concepts and strategies
27 (P). The key concepts in teaching and learning	Presenting real classroom teaching concepts and strategies

2. What did you like least about simSchool?

Comment	**Theme**
1. The options were hard to find and do not necessarily fit the response we seek to give to students.	Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents + Inappropriate/limited options for conversation/interaction with simStudents
2. I would like to see the students' notebooks and know more about the tasks I assigned	Complexity of learning about the concepts that the simulation is built and based on

The thermometer helped me to know what was working but I would need to pause more, refer to student profiles to understand why.	
3. The comments options. Some of them were entirely inappropriate. I would never say them to a student.	Inappropriate/limited/unrealistic options for conversation/interaction with simStudents
4. Limited options for what you can say, or how to set up a lesson, such as explaining an assignment.	Inappropriate/limited/unrealistic options for conversation/interaction with simStudents
5. The mechanics of it! Couldn't find the right tasks and questions in time.	Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents
6. Student responses were weird. - Interface is difficult to use - Limited selection of things I could do	Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents + Inappropriate/limited options for conversation/interaction with simStudents + Unmatched students responses to the chosen tasks/conversation options assigned to them
7. It was really hard to follow up with all the students, It was hard trying to understand their different personalities.	Complexity of learning about the concepts that the simulation is built and based on + Difficult to follow up with all simStudents (Difficulty of use)
8. How we could not type our own responses How responses to the students' gave did not reflect what was said.	Inappropriate/limited/unrealistic options for conversation/interaction with simStudents + Difficulty of use + Unmatched students responses to the chosen tasks/conversation options assigned to them
9. Emotions students display are often very misleading especially when they appear bored or distracted but the data proves this was not the case.	Mis-matched/mis-leading students's visual emotions compared to their actual performance. (Negativity of students responses)
10. It completely lacked any human feelings to it, and seemed distanced from reality and unrealistic. Teaching is interpresonal in nature and there was no significant interaction in any realistic way.	Inappropriate/limited/ unrealistic options for conversation/interaction with simStudents
11. That the kids responses rarely made sense in terms of what you say to them.	Unmatched students responses to the chosen tasks/conversation options assigned to them (Negativity of students responses)
12. Difficulty of navigation between levels of menus for different actions, not realating to my teaching style.	Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents
13. I found the comments difficult to use. I could not always find the comment that I wanted to use or it would take time trying to find the comment that best fit the situation at hand.	Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents + Inappropriate/limited/ unrealistic options for conversation/interaction with simStudents
14. That it was hard to find the right thing that I wanted to say before student had already moved on.	Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents + Inappropriate/limited/ unrealistic options for conversation/interaction with simStudents
15. Restricted to what I could do or say to students.	Inappropriate/limited/ unrealistic options for conversation/interaction with simStudents

16. The majority of the students' comments were negative, even when the teacher says something nice and positive.	Unmatched students responses to the chosen tasks/conversation options assigned to them + Negativity of students' responses
17. - There are some choices, I did not see what I wanted to say. I tried really hard, but was discouraged when the students were still unruly It was a bit difficult for me to use it if I accidently pushed the wrong button/command.	Inappropriate/limited/ unrealistic options for conversation/interaction with simStudents + Unmatched students responses to the chosen tasks/conversation options assigned to them + Difficulty of use
18. No comment.	----
19. - The categorization of the speech bubbles, it was difficult to locate the specific comments that I want to send. - The slow response of the speeches (actions)	Inappropriate/limited/ unrealistic options for conversation/interaction with simStudents + slow reactions of simStudents through each interaction
20. The thing that I liked least with simSchool was that it was hard to memorize and find the particular actions/vocal that I wanted to put into action.	Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents
21. Hard to navigate	Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents
22. Navigation for options/activities were unclear, hard to locate what you want to find, how you would want to respond to the student.	Difficult to navigate in simulation interface through the options for interaction and conversation with simStudents + Inappropriate/limited/ unrealistic options for conversation/interaction with simStudents
P1 (23). It is not easy to play or to use or perhaps it is because I am not so well in playing the game. It is also because I am not so expert in using computer.	Difficulty of use
P2 (24). It is too slow and the graphics is not good. The classroom should be customized with the size of students.	slow reactions of simStudents through each interaction + The graphic is not good
P3 (25). I have not clear understanding of the program, so I need to learn the program first and for me it takes time.	----
P4 (26). It is not so easy to use it effectively immediately.	Difficulty of use
P5 (27). The limited options to interact (action and reaction)	Inappropriate/limited/ unrealistic options for conversation/interaction with simStudents

3. Please provide any suggestions you have for improving simSchool and/or its use with student teachers:

Comment	**Theme**
1. If the test/responses correlate with students better [faster]: student reacts options should come up quicker, in this way we are not spending time working and waiting for the response we want. It was not always clear when students completed an assignment or if they need more time. I liked the progress reports, in the end but it was not intuittive during the simulation when we are interacting with the students (behaviours do not	- Faster responses from simStudents while interacting with them + Better indication of simStudents' academic improvement through working with the simulation-Clearer indicators of simStudents' progress on academic tasks + More matched simStudents' responses/visual emotions with their actual progress (more positive responses). + More realistic conversation between simStudents and the teacher

always indicate agreeableness when in progress results in does.	
2. It is difficult to recall what responses fall under what categories (i.e. behavioural assertation/behavioural observation, etc.). Maybe each could have encouraging and redirecting sub-categories or by clearly ordered from pleased to severe. I did not see student collaboration besides whispering “this is too hard”. I would like to be able to have students turn to each other in groups and change desk arrangement.	Having more clear, user-friendly and more ordered categorization of comments list in the interface for navigation and for interaction with simStudents + Having a customizable classroom + Having a more collaborative classroom
3. Allow users to create individual/original comments. - Have teachers implement on authentic/original lesson on a set topic. Have student responses/interactions more genuine Where was the inclusions of more arts-based activities? Music/drama? - Assigning a task to the entire class, while being able to modify it - Allowing users to create their original comments for interaction with simStudents - Allowing teachers to create and customize their own lessons - More realistic conversation between simStudents and the teacher and certain individual students	Allowing users to create their original comments for interaction with simStudents + Allowing teachers to create and customize their own lessons + More realistic conversation between simStudents and the teacher
4. Perhaps watch a demo of a well-managed class before trying it ourselves. It was a bit demoralizing.	- Having a demo of a well-managed/working class
5. Re-format the actual logistics of the program, make it easier to see the questions being asked by students and by teachers.	- Having more clear, user-friendly and more ordered categorization of comments list in the interface for navigation and for interaction with simStudents
6. Provide a larger area for all the possible actions we could do in interface. - Make the layout more user-friendly.	- Having more clear, user-friendly and more ordered categorization of comments list in the interface for navigation and for interaction with simStudents
7. I suggest more options with interacting (like allowing us to ask a greater variety of questions.)	- Allowing more options for variety of interactions and teaching styles
8. Being able to add own comments, rather than pre-determined responses.	- Allowing users to create their original comments for interaction with simStudents
9. Not all lessons and activities exist and neither does the personality/skills of the teacher. I am not sure how this could be fixed as it would take a lot of work, but it would be a great addition. This means that the students will always respond the same way to a task regardless of the potential interest in differing context. What the program does is showing the importance of	- Allowing more options for variety of interactions and teaching styles

varying instructional strategies by ignoring content and style.	
10. I don't think simSchool will ever be an effective teaching tool, there are simply too many complex interactions that take place in teaching a class to model reality, authentically or effectively.	- Allowing more options for variety of interactions and teaching styles
11. It would be great if the options for activities and speech were in drop-down list format, so you could see all at once instead of having to scroll them. It also wasted time when you decided you no longer wanted to say something but assign an activity and you had to reclick on the student and start again. A back button would be better or the drop-down.	- Having more clear, user-friendly and more ordered categorization of comments list in the interface for navigation and for interaction with simStudents
12. Adjust commands so when you are attempting to do an action (eg: give an activity or say something); you can move between options if you change your mind or don't find what you want in one category, without having to click the person or bell before looking at different category. Students didn't respond as expected from their profile…maybe this is meant to be this way, but it's a bit frustrating.	- Having more clear, user-friendly and more ordered categorization of comments list in the interface for navigation and for interaction with simStudents
13. I would have the comments link/button be a drop menu so you could see the whole category at once.	- Having more clear, user-friendly and more ordered categorization of comments list in the interface for navigation and for interaction with simStudents
14. I think that there needs to be a mix of positivity and negativity from the students. All the students were almost always negative, even after they have completed an activity, and said they get it when I would give positive affirmation they would always reply back negatively. - I also think it would have been nice to have a text box to fill in what I may want to say because the responses are so limited and hard to find. I think that with the speech options it would have been more accessible, if they had all come up on the side of the screen so you could see all of them and choose rather than spending all of your time searching for what you want to say.	Having both negative and positive comments + More positive responses from simStudents + Allowing users to create their original comments for interaction with simStudents
15. Perhaps having a realistic class of students for BC (i.e: ESL learners, autistic, etc.) - Providing opportunity to type in what I would want to say or do. More realistic prompts for assigning activities and responding to students.	Allowing more options for variety of interactions and teaching styles + Having a customizable classroom + Allowing users to create their original comments for interaction with simStudents + More realistic conversation between simStudents and the teacher
16. Change the interface for the commands, I found it difficult to choose exactly what I wanted to say. a. Also have positive commands	Having more clear, user-friendly and more ordered categorization of comments list in the interface for navigation and for interaction with simStudents + Having both negative and

on one side, and negative commands on the other. b. If it is possible, add your own commands c. Also, maybe create a trial version, so students can try playing it as the computer explains the way to do it. d. It may be easier to start with fewer information about a student. I was overwhelmed with all the different traits. e. Different levels with different/specific traits to overcome. Focus on what you're doing right or wrong. When specific traits are accomplished then level up.	positive comments, and more positive responses from simStudents + Allowing users to create their original comments for interaction with simStudents
17. Maybe more prompting as to which student we must address. - Having them be a bit nicer so not to discourage or scare student teachers. - Pick a grade or purpose for the student teacher to focus on, rather than just randomly dealing with the class.	----
18. Maybe provide more tasks?	
19. - If the speech boxes could branch out for easier access that would make the simulation easier to use. – Also if sub-commend were words instead of just color boxes. – Instead of clicking the student to 'cancel' it would be easier if there was a button or options for it. – There was no comment that corresponds to "may I go the washroom".	- Having more clear, user-friendly and more ordered categorization of comments list in the interface for navigation and for interaction with simStudents
20. - The students in simSchool need to have more responses and possibly give out hints and advices to teachers about their performance within the classroom. This will allow student teachers to be able to adapt to students quicker and learn to accommodate students' needs.	----
21. Make navigation simpler	- Having more clear, user-friendly and more ordered categorization of comments list in the interface for navigation and for interaction with simStudents
22. No comment	----
P1 (23). I think I have to learn more about using this game since I am confused when I use it, and it affects the effectiveness of using this game.	----
P2 (24). Please make the teacher appear in front of the class and make a classroom in round table not in a row, teacher in the middle and the students around the teacher. – The text should be changed/complemented with audio/voice complemented.	----

P3 (25). I think it is better for me to know types of assignments and comments available so that when we work with the simulation we just match with the student's personalities.	- Having a demo of a well-managed/working class
P4 (26). The student teachers have to have enough time to learn about how to use the simSchool before they can use it effectively.	----
P5 (27). I wonder if they options for interactions/conversations with students are taught/trained prior to deal with the simSchool.	- Having a demo of a well-managed/working class

Appendix C: simSchool Survey Questionnaire

1. Please choose the appropriate option for each question below:

a. Current course: EDUC 401/2 EDUC 405 EDUC 404
b. In which semester did you begin your PDP program: Fall Spring
c. Teaching focus in program: Elementary Secondary
d. Gender: Male Female
e. Your computer skill:
Computer novice Intermediate user Proficient user
f. Have you ever used a computer-based simulation or game for education?
No Yes
g. Have you ever used a computer-based simulation or game in any other context?
No Yes
h. Estimate how much time (hours and minutes) you spent working with the SimSchool simulation
i. Do you plan to follow the classroom management and teaching strategies in actual classrooms that you learned in SimSchool? Yes No Not sure

2. How realistic did you find the following features of simSchool?

	Very unrealistic	**Unrealistic**	**Unsure**	**Realistic**	**Very realistic**
The characteristics of simStudents compared to the characteristics of real high school students					
Students' profiles					
The design of the simSchool classroom compared to a real classroom situation					
simStudents' behavior					
The outcome of simStudents' academic performance					
Conversations between you as a teacher and simStudents					
Options for assigning academic tasks to simStudents					
Teachers' challenges represented in simSchool					

3. Please rate the effectiveness of simSchool for improving the following skills in classroom teaching:

	Very poor	Poor	Good	Very Good	Excellent
Learning about different student characteristics					
Learning about students' learning needs					
Assigning academic tasks to students					
Classroom activity management					
Classroom time management					
Managing students' behavior					
Paying equal attention to students					
Classroom decision making					
Following up with students' activities					
Learning about interactions between teacher and students					
Creating collaboration in the classroom					
Bringing about student learning and understanding					
Encouraging creativity in classroom activities					
Keeping students engaged in classroom activities					
Enhancing students' motivation and interest in class activities					
Rewarding students appropriately					
Punishing students appropriately					

4. Please rate the following aspects of simSchool:

	Very poor	Poor	Good	Very Good	Excellent
Content has educational value					
Effectively stimulates my creativity					
Covers key concepts of classroom management					
Matches with my previous experiences					
Is generalizable to an appropriate range of situations					
Is motivational to use					
Is easy for me to use					
I could use it without help					
Is flexible for different users					
It has a clear purpose					
I find it fun					
It is free of racial, ethnic, and gender stereotypes					
Feedback on student responses is effectively employed					
Graphics, color and sound are used for appropriate instructional reasons					
It gives me control over the rate and the sequence of the simulation					

5. Please rate simSchool with regard to its effect on you in the following areas:

	Increased	No change	Decreased
Skills			
Knowledge			
Confidence			

6. What did you like most about simSchool?

7. What did you like least about simSchool?

8. Please provide any suggestions you have for improving SimSchool and/or its use with student teachers:

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