Developing and evaluating e-portfolio for the final year project (FYP)

Chi-hung LEUNG
The Hong Kong Institute of Education, Department of Special Education and Counselling
Hong Kong
E-mail : chhleung@ied.edu.hk

The most attractive feature of an e-portfolio is the high student involvement in putting together the contents of an e-portfolio, often through discussion or negotiation with teacher. The portfolio provides a more rounded and reliable assessment of learning achieved than written examinations or essay assignments alone. An evaluation-based learning system for the final year project was set up as e-portfolio for students to monitor their learning process during the semester, including two online evaluations on the knowledge on "research method". Lecturer will revisit the content of "research method" based on the result of online evaluation, and give online reading materials and articles to both experimental group (SN) and control group (SN) to help them write up different parts of project, and control group (Non-SN) without receiving any online materials. There were also two online quizzes to re-assess how much they understand about the content of "research method" again after receiving online materials/articles and lecturer's supervisions in both experimental group (SN) and control group (SN) and just receiving lecturer's supervision in control group (Non-SN). An experimental study, ANCOVA analysis, and within-subject analysis were conducted to reveal students' learning effectiveness in the study. Forty final year full-time BEd (ECE) students in either 15 students in an experimental group (SN) or 25 students in two control groups (15 students in SN and 10 students in Non-SN) were invited to participate in the study. The CLEI (College Learning Effectiveness Inventory) was used to measure student learning effectiveness during the study. The result indicated that students in the experimental group receiving e-portfolio assessment-based learning system performed better in online quizzes and report write-up than the two control groups did. This implies that e-portfolio evaluation-based teaching can help students learn better in writing up the final year project. For students in the experimental group (SN), they are encouraged to upload materials, literatures, or video clips, related to their research topics onto e-learning to share with group mates. As regards learning effectiveness, the within-subject analysis indicated that most students in the experimental group (SN) have shown improvement in academic self-efficacy, organization and attention to study, and class communication by the end of the project. Students reflected higher anticipation of goal achievement, more effective goal planning, and better involvement in class activity.

Introduction

An electronic portfolio provides an environment where students can: collect their work in a digital archive, select specific pieces of work (hyperlink to artifacts) to highlight specific achievements; reflect on the learning demonstrated in the portfolio, in either text or multimedia form; set goals for future learning (or direction) to improve; and celebrate achievement through sharing assessment, teachers (and peers) can review the portfolio document, and provide formative feedback to students on where they could improve (Barrett, 2006). According to Barrett (2001), a portfolio can be defined as collected works and reflections of students that demonstrate their growth along the process. Similarly, an electronic portfolio is defined as the compilation of portfolio items stored in electronic formats such as audio-visual, graphical, or text (Barrett, 2001). The main idea of using an e-portfolio "… is to keep students focused on learning rather than on individual projects or products – e-portfolios are part of the learning process, not a result of it" (Garthwait & Verrill, 2003, p.23). E-portfolio assessment decreased students' stress and increased their self-confidence. This finding shares the same point of view with Solomon (2003) and Frank and Barzilai (2004). There are two majot types of e-portfolios : positivist portfolios and constructivist portfolios.

Positivist Portfolios

The purpose of the portfolio is to assess learning outcomes and those outcomes are, generally, defined externally. The portfolio is a receptacle for examples of student work used to infer what and how much learning has occurred (Knutzen, 2006).

Constructivist Portfolios

The portfolio is a learning environment in which the learner constructs meaning. It assumes that meaning varies across individuals, over time, and with purpose. The portfolio presents process, a record of the processes associated with learning itself; summation of individual portfolio would be too complex for normative description (Knutzen, 2006).

The positivist approach puts a premium on the selection of items that reflect outside standards and interests. The constructivist approach puts a premium on the selection of items that reflect learning from student's perspective (Paulson & Paulson, 1994).

Many of the current leaders in research on portfolios are attempting to balance the educators' need for an assessment management system with the needs of learners for a reflective portfolio. This new conceptual framework must satisfy both the positivist need for a portfolio as a receptacle which indicates how learning standards are being met, and the constructivist need for a portfolio as an intrinsic focus which excites and inspires the learner (Knutzen, 2006).

The present study wants to incoporate two approaches of e-portfolios, called blended e-portfolios, to evaluate student learning process and to enhance their learning effectiveness during the final year project (Figure 1). For the positivist paradigm, two concept lists of the course of 'Research in Childhood" which students had undertook in year 3 were given to all 3 groups (Experimental group – SN, Control group – SN, and Control group – Non SN) in week 1 and week 6 respectively. They were required to take two online quizzes in week 5 and week 9. The key concepts of research mothods were revisited between week 1 and week 5, and between week 5 and week 9 by the tutors in all groups. Only the experiemntal group (SN) and control group (SN) were uploaded reading materials about research methods onto e-learning, students in both groups (SN) were encouraged to dowload the materials when necessary. Control group (SN) was called positivist e-portfolio group. For the constructivist paradigm, students in experimental group (SN) were encouraged to upload materials, literatures, or video clips, related to their research topics onto e-learning to share with. The observation video clips collected from the project were also upload onto the e-learning to share how they recorded children's bebavior in the kindergartens. Experimental group (SN) was then called the blended e-portfolio group.

Three groups of early childhood education (ECE) final year students with two different major areas of study, Special needs and Art and Creative works, were invited to participate in the study. Thirty students from special needs group were randomly assigned in either experimental group or control group. This made up of 15 ECE final year students major in special needs were in experimental group using blended e-portfolios in evaluating their final year project, the remaining 15 final year students in special needs were in control group without using blended e-portfolios. There were also 10 ECE final year student major in Art and Creative works in non-special needs control group without using blended e-portfolio. Chang (2001) suggested to conduct a further experimental study in terms of learning effectiveness for the web-based learning portfolio. College Learning Effectiveness Inventory (CLEI) was used to assessing students' learning effectiveness before and after using blended e-portfolios.
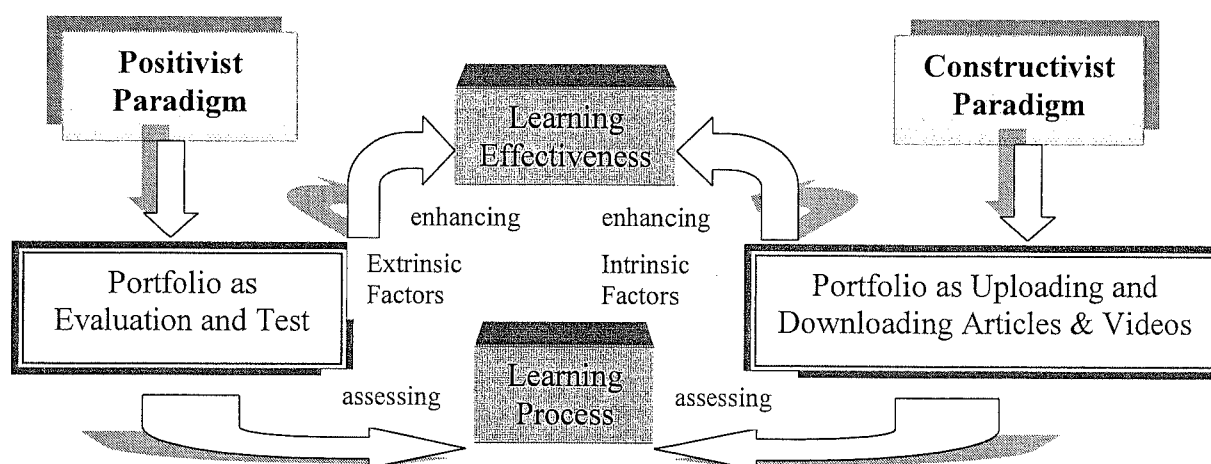
Figure 1 Blended e-portfolio model

Method

Participants

All subjects were the final year students in early childhood education taken the course of "Research in Chidhood" in year 3 before taking the final year project. Thirty students were major in special needs while 10 students were in Art and creative works. All are females aged from 22 to 24.

Instrument

CLEI is an inventory devised by a group of researchers in the Kansas University (Newton et al., 2008). It comprises six scales and 50 questions for measuring the factors that impact on student learning. The six scales include academic self-efficacy (ASE), organisation and attention to study (OAS), stress and time press (STP), involvement with college activity (ICA), emotional satisfaction (ES), and class communication (CC). This inventory approach was modified by Russell and Petrie (1992), who stated that student learning would likely be influenced by academic, personal, social and environmental factors. Participants shall rate their learning approach and attitude on a five-point scale, from 1 (*Never*) to 5 (*Always*).

Academic self-efficacy (ASE) scale.

This scale serves to measure students' expectancy of success, effort made in the school setting and academic ability. High scores reflect high anticipation of goal achievement and outcome, whereas low scores indicate high concern about future achievement. The reliability of this scale is found to be 0.87 in this present study.

Organisation and attention to study (OAS) scale.

This measures students' organisation of tasks, time management and goal-planning. High scores reflect effective planning whereas low scores reflect the lack of attention and avoidance of goal planning. The reliability of this scale is 0.81 in this study.

Stress and time press (STP) scale.

This scale measures how well students manage to face stressful situations and how this will affect their learning. High scores reflect handling stress well, whereas low scores reflect low efficacy in handling stress. The reliability of this scale is 0.77.

Class communication (CC) scale.

This measures both verbal and non-verbal efforts to engage in class activity. High scores reflect good involvement in class activity, whereas low scores reflect reluctance in joining class activity. The reliability of this scale is 0.68.

Design and procedure

All three groups, experimental group (SN), control group (SN), and control group (non-SN), were given an assessment on the first and sixth week of first semester to see what the key concepts and research skills they have learnt in "Research in Childhood". Online True/False quizzes were given in the fifth and nineth week to evaluate how many key concepts and research skills they really understood. Lecturer would revisit the concepts and knowledge of research methods during week 1 to week 4 and week 6 to week 8. Both experimental group (SN) and control group (SN) were asked to download the materials and articles of research methods from the e-learning for revision. The e-learning system would record how many materials they had downloaded.

Students in the experimental group (SN) were also encouraged to upload materials, literatures, or video clips related to their research topics onto e-learning to share with. The observation video clips collected from the project were also upload onto the e-learning to share how they recorded children's bebavior in the kindergartens.

Control group (SN) receiving positivistic e-portfolio (online reading materials, articles, evaluation-based teaching, and project supervision) was called positivistic group, while control group (SN) only receiving lecturer's supervision was called control group. Experimental group (SN) receiving positivist e-porfolio and constructivist e-portfolio (upload materials, literatures, or video clips related to their research topics for sharing) was called blended e-porfolio group.

Data Analysis

ANCOVA was adopted to examine the learning effectiveness among three groups with or without using e-porfolios (Experimental group – SN, Control group – SN, and Control group – SN) while the Time 1 scores of learning effectiveness of three groups as a covariate. Within-subject repeated measure was used to evaluate the difference of learning effectiveness of each individual in three groups in the beginnning and the end of final year project, and the learning process of each individual in three groups between week 1 to week 5 and between week 6 to week 9.

Result

Enhancing students' learning effectiveness using e-portfolio

An analysis of covariance was used to examine whether the students in the experimental group outperformed those in control group regarding the improvement in learning effectiveness As seen in Table 1, the Time-1 subscales of Academic Self-Efficacy (ASE), Organisation and Attention to Study (OAS), Stres and Time Press (STP), and Class Communication (CC) are the non-significant covariates in the ANCOVA, F_{ASE} (2, 38) = 1.35, p>.05, eta^2 = 0.04, F_{OAS} (2, 38) = 0.36, p>.05, eta^2 = 0.01, F_{STP} (2, 38) = 2.05, p>.05, eta^2 = 0.15, and F_{CC} (2, 38) = 2.64, p>05, eta^2 = 0.08,. The Time 2 CLEI results after taking Time 1 CLEI scores as covariates) indicated no group differences found in learning effectivness after using e-portfolio in the experimental group (SN), F_{ASE} (2, 38) = 1.96, p>.05, eta^2 = 0.11, F_{OAS} (2, 38) = 0.50, p>.05, eta^2 = 0.03, F_{STP} (2, 38) = 2.72, p>.05, eta^2 = 0.06, and F_{CC} (2, 38) = 1.26, p>.05, eta^2 = 0.07.

However, when we looked at the graphical presentation of 3 groups in the four subscales of CLEI between Time 1 and Time 2 (see Figure 1 to 4), the mean scores of CLEI of the experimental group (SN) in the subscales of ASE, OAS, and CC in Time 2 were higher than in Time 1. The results indicated that students in the experiemental group (SN) reflected higher anticipation of goal achievement and outcome, more effective goal-planning, and more

reluctance in joining class activity after using e-portfolio in their final year project. Even in the subscale of STP, the mean scores of 3 groups were dropped from Time 1 to Time 2, experimental group (SN) from 19.0 to 18.5, control group (SN) from 20.0 to 18.7, and control group (Non SN) from 19.3 to 17.0. This showed that the control group (Non-SN) reflected the lowest efficacy in handling stress in Time 2 among 3 groups. Importantly, the non-significant ANCOVA results were due to the individual differences in groups, and because of the small sample size in each group, it's necessary to perform within-subject analysis to examine the individual differences among 3 groups between Time 1 and Time 2 in learning effectiveness.

Table 1
ANCOVA for enhancing learning effectiveness using the time 1 scores as a covariate

Learning Effectiveness (College Learning Effectiveness Inventory)

Academic Self-efficacy (ASE)

Source	df	MS	F	p	eta^2
Time 1 scores	1	34.04	1.35	>.05	0.04
Groups	2	49.64	1.96	>.05	0.11
Error	32	25.28			

Organization and Attention to Study (OAS)

Source	df	MS	F	p	eta^2
Time 1 scores	1	3.63	0.36	>.05	0.01
Groups	2	5.06	0.50	>.05	0.03
Error	32	10.05			

Stress and Time Press (STP)

Source	df	MS	F	p	eta^2
Time 1 scores	1	19.90	2.05	>.05	0.15
Groups	2	25.07	2.72	>.05	0.06
Error	32	9.23			

Class Communication (CC)

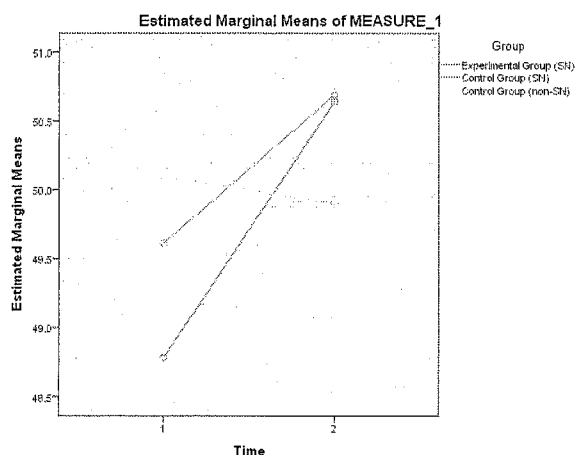| Source	df	MS	F	p	eta^2
Time 1 scores	1	13.13	2.64	>.05	0.08
Groups	2	6.27	1.26	>.05	0.07
Error	32	4.96			

Figure 1 Time 1 & Time 2 difference of Academic Self efficacy
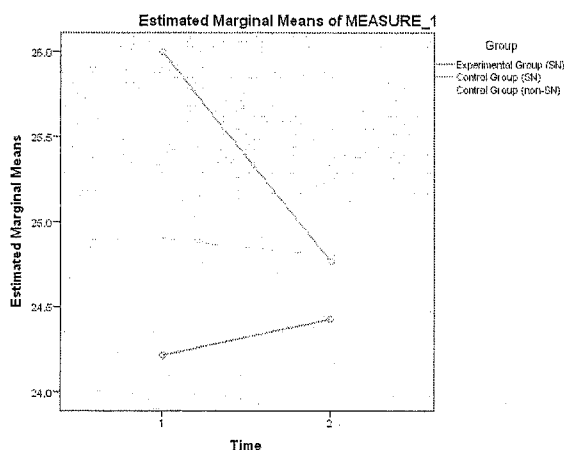

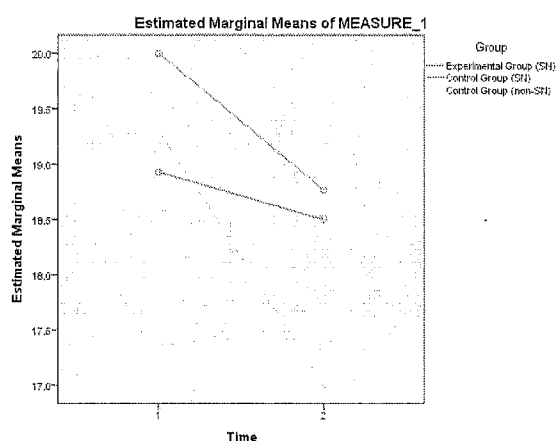Figure 2 Time 1 & Time 2 difference of Organisation & Attention to Study

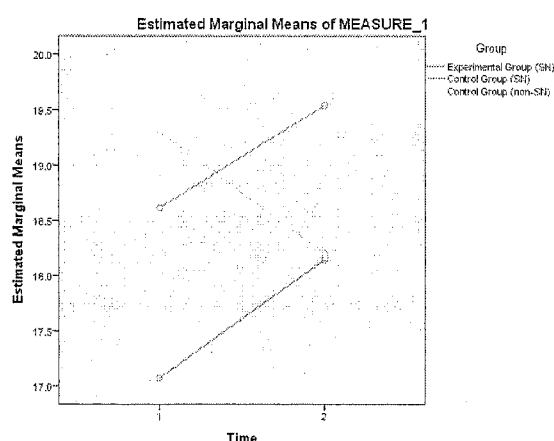Figure 3 Time 1 & Time 2 difference of Stress & Time Press

Figure 4 Time 1 & Time 2 difference of Class Communication

Within-subject differences of 3 groups between Time 1 and Time 2 in four subscales of CLEI

A College Learning Effectiveness Inventory (CLEI) was given to 3 groups of students in the first week and last week of "Final Year Project" to evaluate their learning effectiveness. Since there was no significant difference found in the ANCOVA among 3 groups in the CLEI, the non-significant results is due to large within-subject differences in 3 groups. Therefore, the within-subject analysis was performed to examine the individual differences of learning effectiveness in 3 groups.

8 out of 15 students in control group (SN), 6 out of 10 students in control group (Non-SN), 12 out of 15 students in experimental group (SN) have higher scores in Academic Self-efficacy (ASE) at the end of Project (Figures 5 to 7).

8 out of 15 students in control group (SN), 4 out of 10 students in control group (Non-SN), 10 out of 15 students in experimental group (SN) have higher scores in Organization and Attention to Study (OSA) at the end of Project (Figures 8 to 10).

8 out of 15 students in control group (SN), 2 out of 10 students in control group (Non-SN), 9 out of 15 students in experimental group (SN) have higher scores in Stress and Time Press (STP) at the end of Project (Figures 11 to 13).

11 out of 15 students in control group (SN), 4 out of 10 students in control group (Non-SN), 10 out of 15students in experimental group (SN) have higher scores in Class Communication (CC) at the end of Project (Figures 14 to 16).
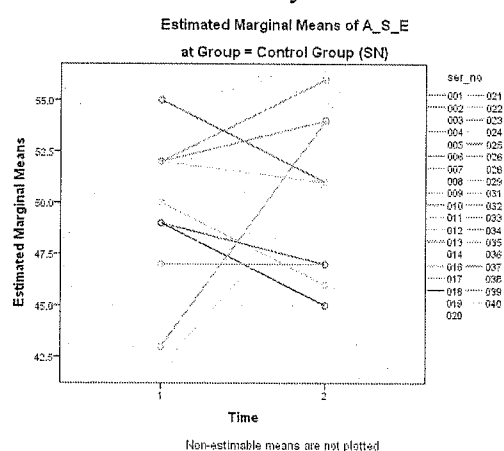
Academic Self-Efficacy

Figure 5 Within-subject differences of Academic Self efficacy between Time 1 and Time 2 (Control Group – SN)
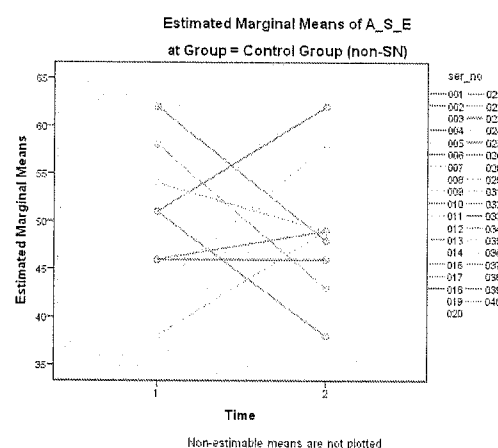

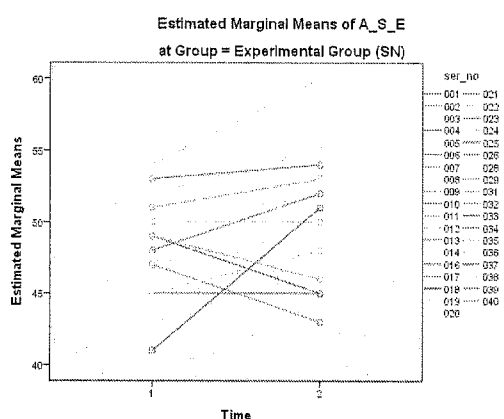Figure 6 Within-subject differences of Academic Self efficacy between Time 1 and Time 2 (Control Group – Non- SN)

Figure 7 Within-subject differences of Academic Self efficacy between Time 1 and Time 2 (Control Group – SN)

Organization and Attention to Study
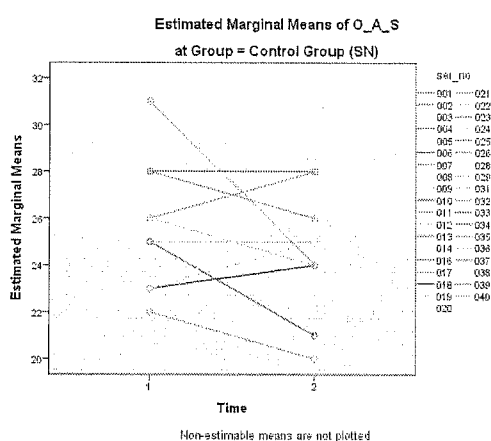
Figure 8 Within-subject differences of Organisation and Attention to Study between Time 1 and Time 2 (Control Group – SN)
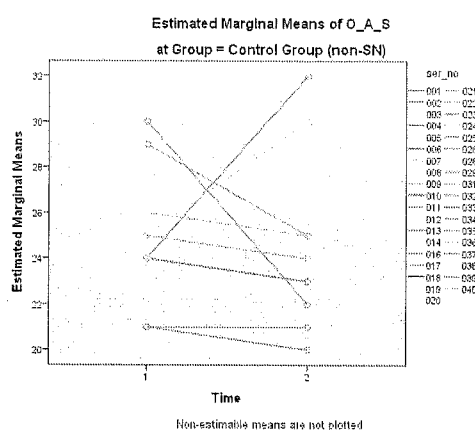

Figure 9Within-subject differences of Organisation and Attention to Study between Time 1 and Time 2 (Control Group –Non SN)
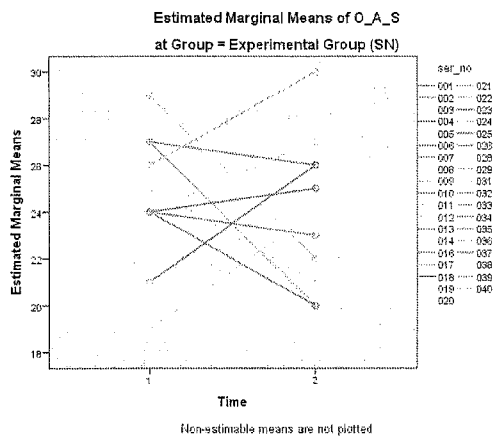
Figure 10 Within-subject differences of Organisation and Attention to Study between Time 1 and Time 2 (Experimental Group – SN)
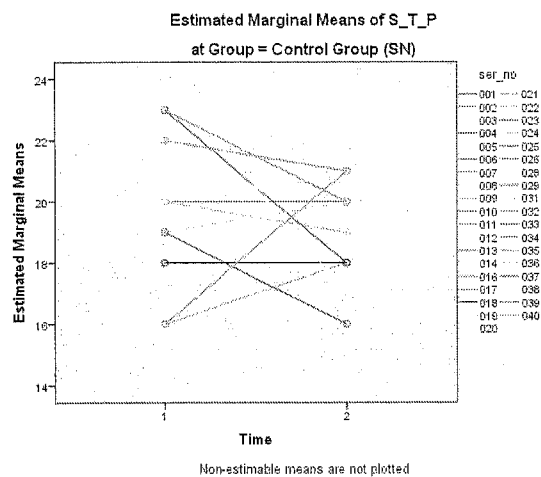
Stress and Time Press

Figure 11 Within-subject differences of Stress and Time Press between Time 1 and Time 2 (Control Group – SN)
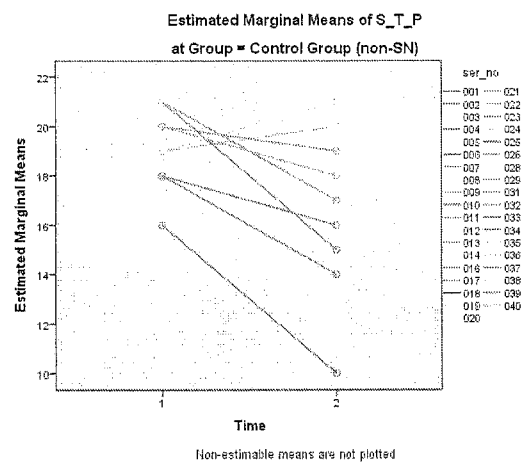

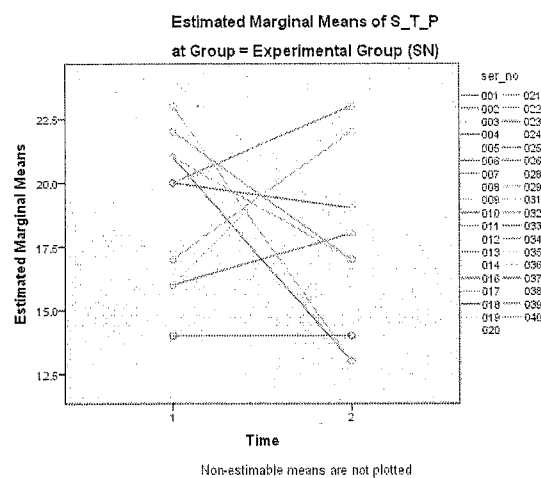Figure 12 Within-subject differences of Stress and Time Press between Time 1 and Time 2 (Control Group – NonSN)

Figure 13 Within-subject differences of Stress and Time Press between Time 1 and Time 2 (Experimental Group – SN)

Class Communication

Estimated Marginal Means of C_C
at Group = Control Group (SN)

Non-estimable means are not plotted

Estimated Marginal Means of C_C
at Group = Control Group (non-SN)

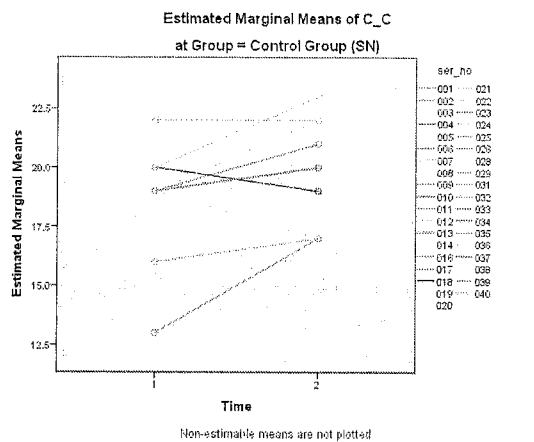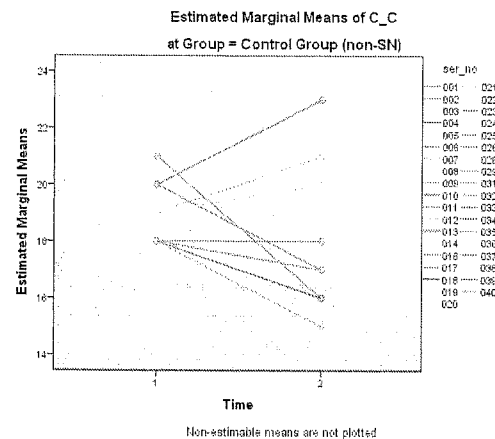Non-estimable means are not plotted

Figure 14 Within-subject differences of Class Communication between Time 1 and Time 2 (Control Group – SN)

Figure 15 Within-subject differences of Class Communication between Time 1 and Time 2 (Control Group –Non- SN)

Estimated Marginal Means of C_C
at Group = Experimental Group (SN)
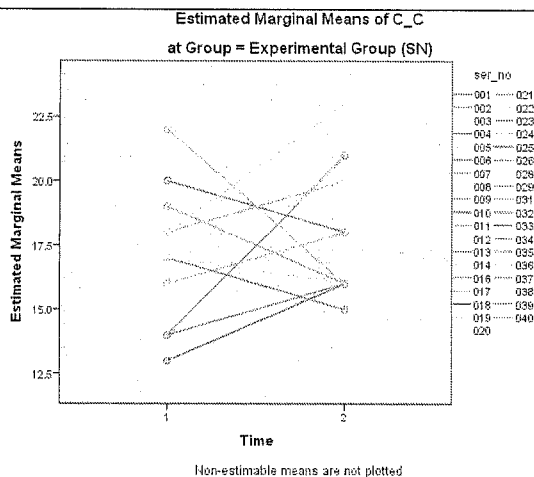

Non-estimable means are not plotted

Figure 16Within-subject differences of Class Communication between Time 1 and Time 2 (Experimental Group – SN)

Examining students' learning process using within-subject analysis
   Difference of concept checklist in week 1 and concept quiz in week 5 among all students
   A concept checklist about the write-up of literature review and research questions was given in week 1 and a quiz related to the concept list was uploaded and received in week 6 to all students to see whether the students in the experimental group (SN) have a better understanding of the above concepts. The results indicated that only one out of 15 students in experimental group (SN) taking positivistic e-fortfolio shown worse performance in quiz than in concept checklist, 6 out of 15 students in control group (SN) without taking positivistic of e-portfolio showed worse performance in quiz, and 5 out of 10 students in control group (Non-SN) without taking positiistic e-portfolio have scored worse in quiz than in concept checklist (Figures 17 to 19).
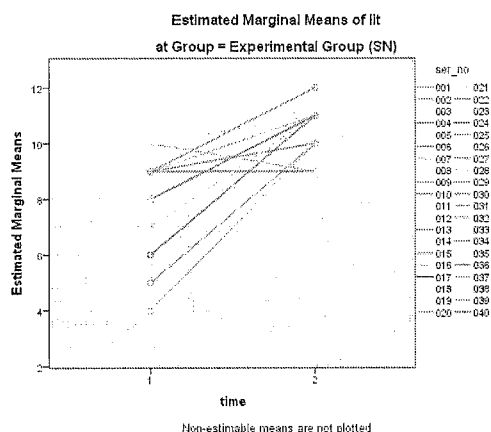
Figure 17 Within-subject differences between Concept checklist in week 1 and Quiz in week 5 (Experimental Group – SN)
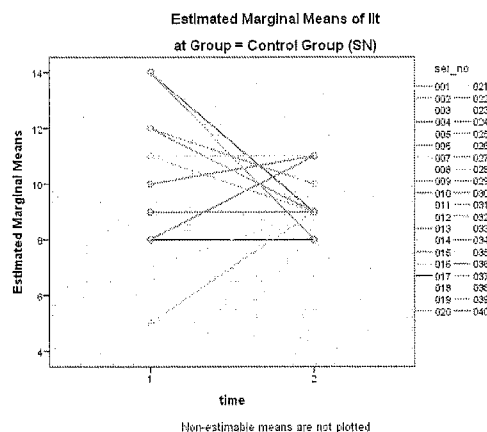

Figure 18 Within-subject differences between Concept checklist in week 1 and Quiz in week 5 (Control Group – SN)
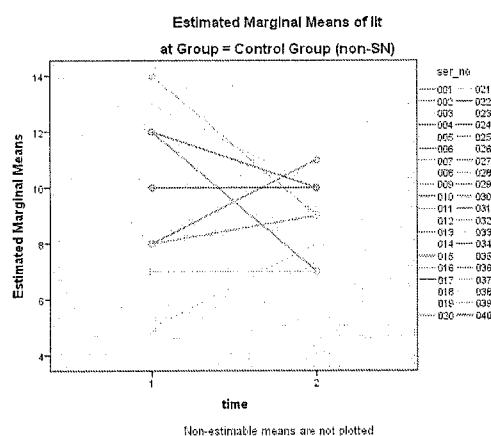

Figure 19 Within-subject differences between Concept checklist in week 1 and Quiz in week 5 (Control Group – Non SN)

Difference of concept checklist in week 6 and concept quiz in week 9 among all students

A concept checklist about the write-up of methodology and results was given in week 6 and a quiz related to the concept list was uploaded and received in week 9 to all students to see whether the students in the experimental group (SN) have a better understanding of the above concepts. The results indicated that only one out of 15 students in experimental group (SN) performed worse in quiz than in concept checklist, all students in control group (SN) showed better performance in quiz, and 3 out of 10 students in control group (Non-SN) have scored worse in quiz than in concept checklist (Figures 20 to 22).
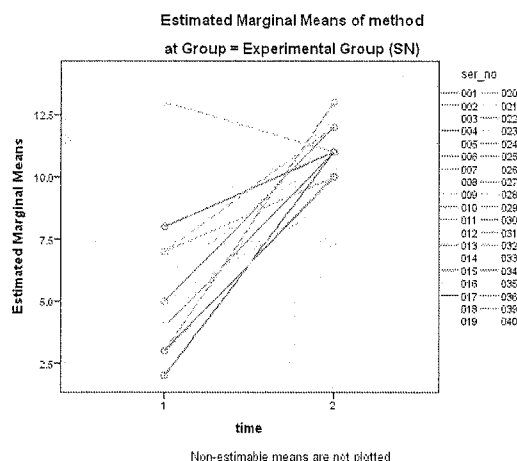
Figure 20 Within-subject differences between Concept checklist in week 6 and Quiz in week 9 (Experimental Group – SN)
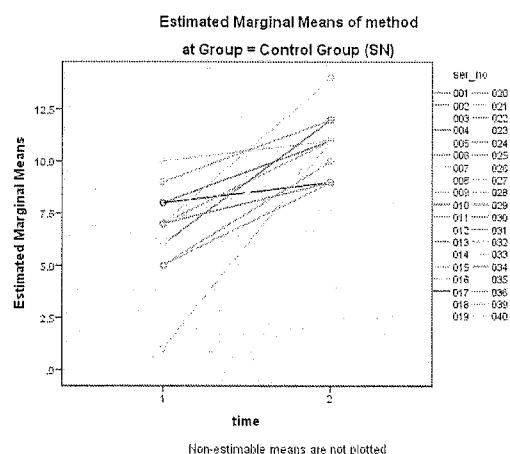

Figure 21 Within-subject differences between Concept checklist in week 6 and Quiz in week 9 (Control Group – SN)
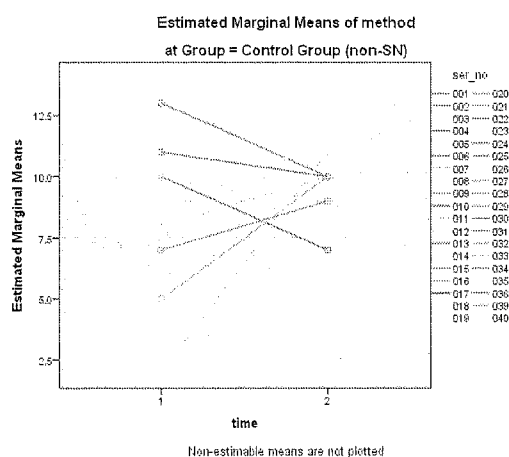

Figure 22 Within-subject differences between Concept checklist in week 6 and Quiz in week 9 (Control Group – Non SN)

Discussion

Enhancing learning effectiveness through e-portfolio
Learn better with evaluation-based teaching
Students in both experimental group (SN) and control group (SN) performed better in the quizzes than the control group (Non-SN) did. It implies the positivistic e-portfolio provide an opportunity to students to download the reading materials and to pay attention to lecturer revision on the concepts of research methods. The online quizzes offer extrinsic factor to motivate students in two SN groups to use positivistic e-portfolio to promote their learning process.

Learning effectiveness is instrinsically motivated by blended e-portfolio
Most students in experimental group gained higher scores in ASE, OAS, and CC. Simply speakng, blended e-porfolio, especially in contructtivistic paradigm (sharing video clips and observation records within the groups) could enhance class communication, attention and goal planning to the project could also be promoted with better class communication. This may lead to better time and stress management to the study. In other words, possibly owing to lack of attention and avoidance of goal planning at the end of the semester, most students in both

control groups (SN and Non-SN) scored lower in CC at the end of the semester, which may reflect they are reluctant to join in class activity. Students in these two groups focus more on their project write-up than on goal planning and class activities, since the project due date is drawing nearer. It was found that learning effectiveness is instrinsically motivated by blended e-portfolio.

Suggestions
Enhancing learning effectiveness with blended e-portfolio approach
It is suggested to adopt in design blended e-portfolio which can facilitate students to attain the intended learning outcomes (Willis & Kissane, 1995; Towers, 1996), enhance students' generic and specific skills, and improve both the student's and the teacher's perception of teaching and learning. Practically, the use of blended e-portfolio can help teachers decrease exercises and/or quizzes grading workloads, provide immediate feedbacks on improving teaching and learning effectiveness, evaluate students' learning process, and motivate students to learn both instrincally and extrinsically.

Limitations
Since the present study adopts quasi experimental design, the assignment of subjects in either experimental group or control groups is restricted to their pre-existing nature, like majors of the study (Special needs or Arts and creative works). The findings of the present study is hard to generalise, but it provides a very good reference for higher education teachers to promote their teaching with e-portfolio.

Conclusion
The study aimed to develop an e-portfolio in final year project to demonstrate exemplary cases of effective teaching and learning in the undergraduate program. The e-portfolio provides a more rounded and reliable assessment of learning achieved than written examinations or essay assignments alone. An evaluation-based learning system for the final year project was set up as e-portfolio for students to monitor their learning process during the semester, including two online evaluations on the knowledge on "research method". Lecturer will revisit the content of "research method" based on the result of online evaluation, and give online reading materials and articles to both experimental group (SN) and control group (SN) to help them write up different parts of project, and control group (Non-SN) without receiving any online materials. There were also two online quizzes to re-assess how much they understand about the content of "research method" again after receiving online materials/articles and lecturer's supervisions in both experimental group (SN) and control group (SN) and just receiving lecturer's supervision in control group (Non-SN) An experimental study, ANCOVA analysis, and within-subject analysis were conducted to reveal students' learning effectiveness in the study. Forty final year full-time BEd (ECE) students in either 15 students in an experimental group (SN) or 25 students in two control groups (15 students in SN and 10 students in Non-SN) were invited to participate in the study. The CLEI (College Learning Effectiveness Inventory) was used to measure student learning effectiveness during the study. The result indicated that students in the experimental group receiving e-portfolio assessment-based learning system performed better in online quizzes and report write-up than the two control groups did. This implies that e-portfolio evaluation-based teaching can help students learn better in writing up the final year project. For students in the experimental group (SN), they are encouraged to upload materials, literatures, or video clips, related to their research topics onto e-learning to share with group mates. As regards learning effectiveness, the within-subject analysis indicated that most students in the experimental group (SN) have shown improvement in academic self-efficacy, organization and attention to

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