Teaching Strategy to Enhance Information and Communication Technology (ICT) Instructional Skills

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Abstract

The progression of Information and Communication Technology (ICT) use has kindled new ways of learning. Effectiveness of new strategies of learning needs to be scientifically tested to assure their efficacy in instruction. The study aimed to look into the influence of blended learning environment on the pre-service teachers' ICT instructional skills. Respondents of the study were pre-service teachers enrolled in Benguet State University. The study employed the static pretest-posttest control group experimental research design. Descriptive and inferential statistics were used to treat the data. Research findings revealed that pre-service teachers' performance before and after the conduct of face-to-face and blended modes of learning exhibited substantial increase in their learning. Exceedingly high learning result along use of blended mode were disclosed along technology literacy, knowledge deepening, knowledge creation, use of ICT to introduce new lessons and use of ICT to extend learning. Similarly, comparable learning results along face-to-face mode of learning were noted along technology literacy, knowledge deepening, knowledge creation, use of ICT to introduce new lessons, reinforce learning, and use of ICT to supplement knowledge. The use of both face-to-face and blended modes of learning led to significant acceleration of ICT skills development of pre-service teachers. Learning gains between blended learning and face-to-face modes learning are comparable. They are likewise complementary in developing the pre-service teachers' ICT instructional skills.

KEYWORDS

Information and Communication
Technology (ICT)
Instructional skills
face-to-face mode
blended learning

Introduction

Information and Communication Technology (ICT) has become an imperative tool in learning and teaching. It offers engaging and fast-evolving learning environments, blurs the boundaries between formal and informal education and prompts teachers to discover new ways of teaching, and facilitating students learning. It entails education to re-think what skills and competencies students need in order to become active citizens and members of the workforce in a knowledge society (UNESCO, 2011). Teaching is becoming one of the most challenging professions in the society where knowledge is expanding uncontrollably and modern technologies are demanding teachers to learn how to use these technologies in their teaching. While new technologies escalate teachers' training needs,

they also offer part of the solution. ICT can provide more flexible and effective ways for professional development for teachers, improve pre and in-service teacher trainings, and connect teachers to the global teacher community (Jung, 2005).

The primary factor that influences the effectiveness of learning is not the availability of technology, but the pedagogical design for the effective use of ICT (Mandell et al., 2002). As mentioned by Earle (2000), the computer should be fitted into the curriculum, not the curriculum into the computer. This is explained where computers are used by the teachers to enhance students' learning and not the other way around. Effective ICT integration should focus on pedagogy design by justifying how the technology is used in such a way and why. With the appropriate ICT integration into the teaching-learning process, students will be well-engaged in learning. For instance, using multimedia to present authentic and ill-structured learning activities can motivate and challenge students and hence develop their problem-solving skills (Savery & Duffy, 1995; Wang & Woo, 2007).

Modern developments in ICT have provided new possibilities to teaching professions, but at the same time have placed more demands on teachers to learn how to appropriately use these new technologies in their teaching (Robinson & Latchem, 2003). One of the growing approaches in teaching is the use of blended learning. Yerasimou (2010) mentioned that numerous education institutions and training organizations use a blend of learning approaches to more efficiently serve their learners by combining face-to-face and online strategies, as well as technological means. Schools are now getting interested in blending the traditional approach with web-based learning. In a study conducted by Marquis (2004), a great majority of higher-education faculty members believe that a combination of online and classroom-based teaching is more effective than classroom teaching alone.

Blended learning has been rapidly growing in both education and corporate settings. Researchers, instructional designers, and educators have been focusing on discovering instructional strategies and technology tools that can lead to effective blended learning practices (Yerasimou, 2010). Blended learning integrates face-to-face and online learning (Garrison & Vaughan, 2007). Correspondingly, Rosset and Frazee (2006) describe blended learning

(BL) as integration of opposite approaches, such as formal and informal learning, face-to-face and online experiences, directed paths and reliance on self-direction, and digital references and collegial connections, in order to achieve individual and organizational goals. Bailey et al. (2013) underscore that blended learning is not just a different initiative. It is a fundamental redesign of instructional models with the aim of accelerating learning.

According to Vaughan (2007), Dziuban et al. (2004), and Felea (2013), blended learning, also known as hybrid learning and mixed-mode instruction, has been going on for a long while due to the complex nature of teaching/learning. However, at the beginning of the new millennium, the development of technology especially the escalating internet use and the discoveries of new learning theories brought forth practices and discussions on the remarkable shift going on in pedagogical approaches from the teacher-centered into a learner-centered.

Some models of blended learning which were found useful in the study include the International Business Machines Corporation (IBM) 4-Tier Model and Community of Inquiry (CoI) Framework. IBM (2002) had conducted extensive research on effective learning approaches and found that collaboration is the method that secures the highest retention rates. Based on this research, they designed the IBM 4-tier model that blends traditional learning with new e-learning approaches and tools. The framework consists of four basic categories: 1) Learn from Information; 2) Learn from Interaction; 3) Learn from Collaboration; and 4) Learn from Collocation.

In the Philippines, the Commission on Higher Education (CHED) obliged Teacher Education Institutions (TEIs) to provide Educational Technology Laboratory Requirements (CMO 52, series 2007) to ensure the exposure of would-be teachers in the utilization of modern instructional technologies and to support the development of their 21st century skills and achievement of ICT utilization competencies described in the National Competency-Based Teacher Standards. Provision of instructional technologies has given learning institutions chances to integrate ICTs in the teaching and learning process. Opportunities for blended learning in schools are possible.

The county's Teacher Education and

Development Program (TEDP) conceptualizes a teacher's career path as a continuum that starts with the entry to a teacher education program and concludes when a teacher retires from the formal service. Pre-service teachers' entry to the teacher education programs commences their teacher education development program. This continues when they go into the real world of teaching. The experiences encountered by the students in their pre-service training contribute a lot in shaping their teaching skills. One of the skills future teachers need to develop is their ICT-pedagogy skills. Education students should not only know how to use ICTs but they should gain competence and confidence in using them in learning and teaching. With the above scenario, exploring possibilities in training would be teachers to better develop their skills in using ICTs in facilitating learning is needed. Teacher education institutions need to explore these possibilities so as to unveil more efficient ways of preparing future educators to be more competent and efficient teachers in the 21st century.

Developing the ICT competence of teachers are affected by the experiences and technology supports provided by the institution. The presence of instructional technologies in schools though, do not guarantee its maximum utilization by the teachers. This was confirmed by Lubrica et al. (2012) in their survey among Teacher Education Institutions (TEIs) that state universities and colleges (SUCs) in CAR have available instructional technologies but utilization is not maximized due to inadequate knowledge and skills in regards to bridging technology and pedagogy in teacher education. According to UNESCO, "*It is not enough to install technology into classrooms – it must be integrated to learning.*" While there are available instructional technologies, other needed ICT facilities are also deficient.

Studies on blended learning has begun to roll out only in the past few years. According to Sparks (2015), blended learning continued to evolve in classrooms, but there is little consensus on what exactly the term encompasses. These further hamstrings efforts to build a clear knowledge of whether, when, and how the strategy of combining face-to-face instruction with technology-based lessons actually works. Based on literature review, there were no experimental studies yet to show the influence of blended learning to the ICT instructional practices of pre-service teachers. One of the possible way to unveil how blended learning

can be appropriately used to better enhance the ICT-pedagogy skills of would-be teachers is through an experimental study in the infusion of blended learning mode in the course of study. Considering the above scenarios, this study investigated the effects of blended learning exposure to the ICT instructional skills of pre-service teachers.

Exploring possibilities to improve teaching and learning experiences must be a continuing process. The results of this study will serve as a basis in enhancing the teacher education curriculum. The research findings may be used by educators in various TEIs as basis in enhancing their mode of delivery using ICT as a productive tool in teaching and learning. The model that was developed may be adopted by TEIs in implementing blended learning in their classes. Students engaged in blended learning will be able to enrich their learning in a more constructive and challenging way. Researchers may as well use the findings of this study as their basis in coming up with a new framework that may lead to innovative ways of using ICT in instruction.
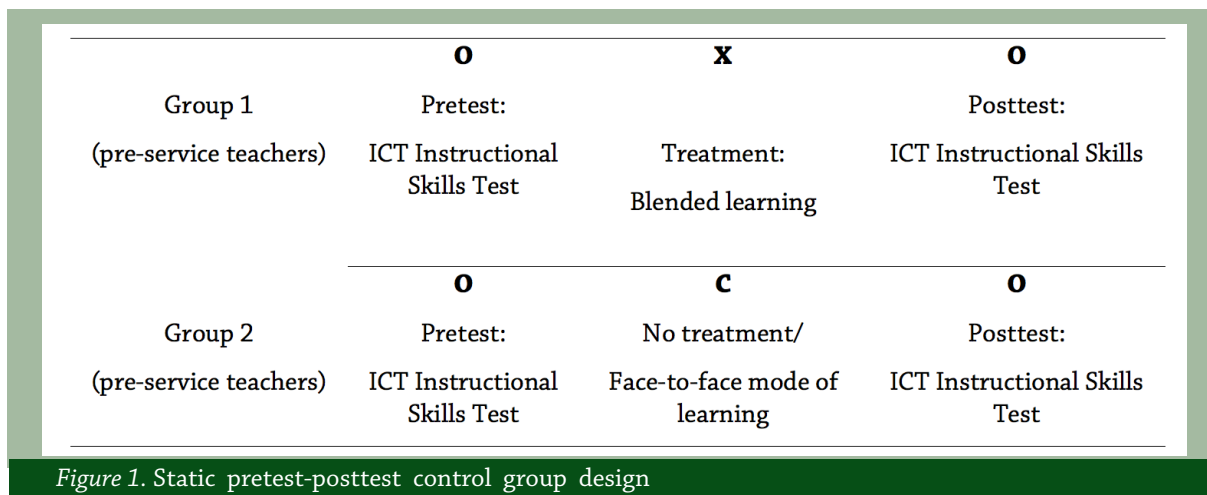
The study determined the effect of face-to-face and blended learning exposure to the ICT instructional skills of pre-service teachers. Specifically, it aimed to: find out the difference between the control and experimental groups' extent of ICT instructional skills before blended learning; find out the difference within the control and experimental groups' extent of ICT instructional skills as manifested in their performance before and after blended learning; and find out the difference between the control and experimental groups' learning gain in their ICT instructional skills after blended learning.

Methodology

Research Design

The study employed the experimental research design specifically the static pretest-posttest control group design. This is graphically illustrated in Figure 1. Symbols were used to represent different functions. O refers to the measurement of the dependent variables. X symbolizes the experimental treatment while C represents the control group.

	O	**X**	**O**
Group 1 (pre-service teachers)	Pretest: ICT Instructional Skills Test	Treatment: Blended learning	Posttest: ICT Instructional Skills Test
	O	**C**	**O**
Group 2 (pre-service teachers)	Pretest: ICT Instructional Skills Test	No treatment/ Face-to-face mode of learning	Posttest: ICT Instructional Skills Test

Figure 1. Static pretest-posttest control group design

Respondents of the Study

Pre-service teachers enrolled in Educational Technology 2 during the 2nd Semester, SY 2016-2017 in Benguet State University (BSU) served as the respondents of the study. Preliminarily, four classes were pre-tested to serve as baseline in choosing the respondents. As a result, two class sections with comparable proficiency level in terms of ICT instructional skills were chosen to form the control and experimental groups. As shown in Table 1, the pretest marks of the control and experimental groups resulted to a probability of 0.2462. This indicates that their level of proficiency is similar. This has established an equal footing between the two groups as to their baseline capability for ICT integration before the conduct of blended learning. As a prerequisite, all respondents in this study had successfully taken IT 11 or Introduction to Information Technology and Educational Technology 1 which covers the approaches and principles in using technology for teaching and learning. This was to ensure that the respondents have the basic knowledge in using computers in accomplishing learning tasks.

Data Gathering Instrument

Questionnaire for the study was adapted from the UNESCO ICT Competency Framework for Teachers (version 2). The tool was pilot tested to a qualified group of pre-service teachers before the conduct of the study. Cronbach's Alpha was used to test the reliability of the data gathering instrument. Data gathering tool for parts 1 and 2 have a Cronbach's Alpha results of 0.96 and 0.93, respectively. Reliability results indicated that the internal consistencies of the questionnaires are very high, hence, the data gathering tool was deemed reliable.

Data Gathering Procedure

Before gathering the data, the researchers sought the approval of the head of institution. Prior to the conduct of the study, pretest on instructional skills to assess the competence of the pre-service teachers was administered to the target classes (Educational Technology 2). Based on statistical computations, two classes with similar competence were selected to form the experimental and control groups. Selection of respondents was carefully done to ensure equal footing among experimental and control group before the conduct of blended learning.

The study was conducted during the 2nd semester of SY 2016-2017. Figure 2 shows the schedule of blended learning.

Table 1

Pre-Service Teachers' Extent of ICT Instructional Skills Before Blended Learning

	Control Group (Face-to-Face Mode)	Experimental Group 'Blended Learning'	*t*-value	prob.
ICT Instructional Skills	2.98 (MP)	2.94 (MP)	1.1655 [ns]	0.2462

ns = not significant

JAN	FEB	MAR	APRIL	MAY
Pretest		**BLENDED LEARNING**		**Posttest**

Figure 2. Schedule of blended learning activity

Blended learning. Blended learning as used in the study pertains to the thoughtful integration of face-to-face and online mode of learning. This served as the experimental treatment of the study. During the conduct of blended learning, students accomplished their learning task in a flexible schedule. This flexible schedule allowed them to accomplish their learning tasks at their learning pace but with an agreed timeframe or deadlines. Online activities and face-to-face meetings were realized. Online forums and support help guide/resources were provided to students to ensure productive learning. Online learning activities such as forums, blogs, wikis and other learning supports were provided to learners. Aside from electronic mails, the class used http://www.bsu.edu20.org as online learning portal in realizing online forums and other activities. A help guide accessible at https://educate.intel.com served as learning support in accomplishing their outputs. Face-to-face meetings were also scheduled to allow face-to-face interactive discussions. Students worked cooperatively with their assigned groups. Group and individual outputs were realized. Cooperative, project-based and constructivist learning approaches were employed along the course of blended learning. The course facilitator monitored and guided the learners in accomplishing their tasks. Constructive feedbacks were given to the learners as they accomplished their tasks.

Face-to-face mode. The control group underwent solely the regular face-to-face mode of learning strictly eliminating the online learning aspect. Use of technologies in this mode was restricted to those that support face-to-face mode of learning such as use of Powerpoint presentations and other productive tools which supported knowledge construction during their regular hands-on activities. Students reported to class and developed their required outputs based on regular class schedules.

After the conduct of face-to-face and blended learning, a posttest was administered to both control and experimental groups. Learning gains after blended learning activities were then determined.

Data Analysis

Data were analyzed using descriptive and inferential statistics. These include weighted means, ranks and t-test. T-test was used to determine if there were significant differences between the control and experimental groups' extent of ICT instructional practices before blended learning; within the control and experimental groups' extent of ICT instructional skills as manifested in their performance before and after blended learning; and between the control and experimental groups' learning gain in their ICT instructional practices after blended learning.

Results and Discussion

Extent of ICT Instructional Practices before Blended Learning

The extent of ICT instructional practices of pre-service teachers before blended learning activities are shown in Table 2. ICT instructional skills as revealed in the table are moderately practiced by the respondents from both control and experimental groups.

This means that before the blended learning activity, both groups of respondents have equal footing when it comes to their level of ICT integration practices. Prior knowledge of the respondents are attributed to their earlier training in the use of computers. In the teacher education curriculum, students are required to take Information Technology course before enrolling in Educational Technology.

In addition, the availability of virtual library in the university and accessibility of computer centers near the university have enhanced the skills of the students in using computers.

As reflected in the table, respondents under control group have manifested highest ICT skills

Table 2

Pre-Service Teachers' Extent of ICT Instructional Practices Before Blended Learning

ICT Instructional Skills	Control Group (Regular Face-to-Face Set-Up)	DE	Experimental Group (Blended Learning)	DE	*t*-value	prob.
Technology Literacy	3.00	MP	2.90	MP	1.3798^{ns}	0.1757
Knowledge Deepening	2.77	MP	2.79	MP	0.2687^{ns}	0.7899
Knowledge Creation	2.80	MP	2.82	MP	0.3203^{ns}	0.7535
Planning for ICT integration	3.11	MP	3.13	MP	0.1236^{ns}	0.9076
Use of ICT to Introduce	3.06	MP	2.98	MP	1.8766^{ns}	0.1338
Use of ICT to Reinforce	2.97	MP	3.04	MP	0.7259^{ns}	0.5081
Use of ICT to Supplement	2.98	MP	2.88	MP	1.0084^{ns}	0.3703
Use of ICT to Extend	3.17	MP	2.95	MP	1.8906^{ns}	0.1317
Overall Weighted Mean	2.98	MP	2.94	MP	1.1655^{ns}	0.2462

Legend: 3.26 – 4.00   Highly Practiced (HP) –highly knowledgeable and can integrate ICT with competence
2.51 – 3.25   Moderately Practiced (MP)-somewhat knowledgeable and can integrate ICT with moderate competence
1.76 – 2.50   Slightly Practiced (SP)-slightly knowledgeable on this and not confident in ICT integration
1.00 – 1.75   Not Practiced (NP)- not knowledgeable on this

along use of ICT to extend and planning for ICT integration and lowest was noted along knowledge creation and knowledge deepening. Respondents under the experimental group topped planning for ICT integration followed by use of ICT to reinforce. Similar to their counterpart, they showed least ICT skills manifestation along knowledge creation and knowledge deepening. Though both groups showed variations in their leading practices, the overall manifestation of their instructional skills practice using ICT is similar as proven by the computed *t*-value of 1.1655 with a probability 0.2462. This result gave a common ground as to the two groups' extent of ICT instructional skills practice in using ICTs. Thus, the two groups were chosen as the respondents of the study.

Extent of ICT Instructional Skills Before and After Face-to-Face and Blended Learning

The differences within the control and experimental groups' extent of ICT instructional practices as manifested in their performance before and after face-to-face and blended modes of learning were shown in Tables 3 and 4 . Both control group and experimental group exhibited substantial increase of ICT skills development as shown by their computed t- values which range from significant to

highly significant. This reveals that the respondents have gained knowledge and developed their ICT instructional skills in both face-to-face and blended modes of learning.

Along face-to-face learning mode (Table 3), highly significant results were noted along technology literacy, knowledge deepening, knowledge creation, use of ICT to introduce new lessons, use of ICT to reinforce learning, and use of ICT to supplement knowledge. This result confirms that these instructional skills can be impressively enhanced through face-to-face mode of learning. Other instructional skills such as planning for ICT integration and use of ICT to extend learning are as well considerably enhanced through face-to-face mode of learning.

Likewise, blended mode of learning, as shown in Table 4 disclosed highly significant results along technology literacy, knowledge deepening, knowledge creation, use of ICT to introduce, and use of ICT to extend learning, while significant results were noted along planning for ICT integration, use of ICT to reinforce, and use of ICT to extend learning. Similar observations were noted along face-to-face mode of learning. These findings demonstrate that both face-to-face and blended

Table 3

Difference Within the Control Group's Extent of ICT Instructional Practices Before and After Face-to-Face Mode of Learning

ICT Instructional Skills	Control Group (Face-to-Face Mode)			
	BEFORE	AFTER	t-stat	prob.
Technology Literacy	3.00 (MP)	3.51 (HP)	15.4288**	.0000
Knowledge Deepening	2.77 (MP)	3.46 (HP)	28.2671**	.0000
Knowledge Creation	2.80 (MP)	3.18 (MP)	25.7312**	.0000
Planning for ICT integration	3.11 (MP)	3.69 (HP)	6.4994*	.0229
Use of ICT to Introduce	3.06 (MP)	3.81 (HP)	46.7654**	.0005
Use of ICT to Reinforce	2.97 (MP)	3.67 (HP)	40.4615**	.0006
Use of ICT to Supplement	2.98 (MP)	3.67 (HP)	13.2908**	.0056
Use of ICT to Extend	3.17 (MP)	3.74 (HP)	7.7500*	.0162
Overall Weighted Mean	2.92 (MP)	3.59 (HP)	9.1947**	.0000

*Significant   ** Highly Significant*

Legend: 3.26 – 4.00   *Highly Practiced (HP) –highly knowledgeable and can integrate ICT with competence*
          2.51 – 3.25   *Moderately Practiced (MP)-somewhat knowledgeable and can integrate ICT with moderate competence*
          1.76 – 2.50   *Slightly Practiced (SP)-slightly knowledgeable on this and not confident in ICT integration*
          1.00 – 1.75   *Not Practiced (NP)- not knowledgeable on this*

Table 4

Difference Within the Control and Experimental Groups' Extent of ICT Instructional Practices Before and After Blended Learning

ICT Instructional Skills	Experimental Group (Blended Learning)			
	BEFORE	AFTER	t-stat	prob.
Technology Literacy	2.90 (MP)	3.44 (HP)	17.9173**	.0000
Knowledge Deepening	2.79 (MP)	3.37 (HP)	18.1439**	.0000
Knowledge Creation	2.82 (MP)	3.08 (MP)	15.7401**	.0000
Planning for ICT integration	3.13 (MP)	3.61 (HP)	9.3395*	.0113
Use of ICT to Introduce	2.98 (MP)	3.65 (HP)	115.1304**	.0000
Use of ICT to Reinforce	3.04 (MP)	3.52 (HP)	6.2781*	.0244
Use of ICT to Supplement	2.88 (MP)	3.44 (HP)	61.0000**	.0002
Use of ICT to Extend	2.95 (MP)	3.69 (HP)	6.0474*	.0263
Overall Weighted Mean	2.86 (MP)	3.45 (HP)	6.8859**	.0000

*Significant   ** Highly Significant*

Legend: 3.26 – 4.00   *Highly Practiced (HP) –highly knowledgeable and can integrate ICT with competence*
          2.51 – 3.25   *Moderately Practiced (MP)-somewhat knowledgeable and can integrate ICT with moderate competence*
          1.76 – 2.50   *Slightly Practiced (SP)-slightly knowledgeable on this and not confident in ICT integration*
          1.00 – 1.75   *Not Practiced (NP)- not knowledgeable on this*

modes of learning potentially contribute to the pre-service teachers' ICT skills development. The result is ascribed to the appropriateness of mode of learning employed to the learner and subject matter. Use of learning modes were coupled with learner centered strategies which allowed learners to be actively engaged in learning. Ablaza and Yango (2012) inferred that proper use of instructional devices positively affects the performance of the learners. Additionally Cox et al. (2004) mentioned that when teachers use their knowledge of both the subject and the way students understood the subject, their use of ICT has a more direct effect on students' attainment. Wang and Woo (2007), as well, agreed that ICT has the potential to improve student learning outcomes and effectiveness if it is used properly.

Further investigation of the extent of ICT instructional skills practice before and after face-to-face and blended modes of learning unveiled that majority of the ICT instructional skills were elevated from moderately practiced to highly practiced. This reveals that the mode of learning has positively contributed to the pre-service teachers' competence in their ICT instructional practices, however, more improvement is needed along knowledge creation. Among the ICT instructional skills of pre-service teachers, knowledge creation is least practiced. Knowledge creation takes account of explicitly modeling reasoning, problem solving and knowledge construction while teaching students; designing online materials and activities that engage students in collaborative problem-solving, research or creating art; helping students incorporate multimedia production, web production and publishing technologies into their projects in ways that support their ongoing knowledge production and communication with other audiences; helping students reflect on their own learning; describing the function and purpose of ICT production tools and resources (multimedia recording and production equipment, editing tools, publication software, web design tools) and using them to support students' innovation and knowledge creation; describing the function and purpose of virtual environments and knowledge-building environments, and using them to increase knowledge and understanding of subjects in the curriculum and developing online and face-to-face learning communities; describing the function and purpose of planning and thinking tools and using them to support students' creation and planning of their own learning activities and their continuous

reflective thinking and learning; and using ICT resources to share and discuss best practice in teaching. Since knowledge creation requires higher level of ICT skills manifestation, it requires longer time to gain knowledge and skills, requiring more practice to be highly proficient. This also suggests that more emphasis and training along this area is needed.

The progress in ICT skills practice among the pre-service teachers from moderate to highly practice reveals a noteworthy impact of learning progress. Exposing learners to alternative mode of learning provided them with new opportunities of discovering strategies for self-directed learning and creativity. Students exposed in both face-to-face and blended learning have earned learning experiences that may serve as basis for managing alternative learning in their future careers as teachers. These experiences include self-directed learning, online collaboration, independent planning, problem solving, time management, group accountability and responsibility.

Utmost skills improvement is manifested along use of ICT to extend and use of it to introduce lessons. Pre-service teachers can already model the instructional practices in using ICT to extend learning such as designing projects using computers, designing learning activities that will allow learners to explore the use of technology for discovery learning, and allowing learners to select and analyze support topics using technology in ways that broaden their problem-solving skills. Moreover, they also show increased competence in using ICT to introduce new lessons or concepts. This is manifested in engaging learners with the new lesson using multimedia, using multimedia presentations to introduce the lesson, and assigning learners to present the new topics using technology. Other ICT instructional skills that have substantial development include planning for ICT integration, use of ICT to reinforce learning, use of ICT to supplement, technology literacy, and knowledge deepening.

In the study conducted by Jacob and Larsen (2012) on teacher and student perspectives on a blended learning intensive English program writing course, they found that students discovered to work more autonomously and directed while more responsible for their own learning. This aided the teachers to better provide help, keep better track of student progress, and finish more lessons.

Learning Gains after Face-to-Face and Blended Learning

After the conduct of face-to-face and blended modes of learning, the respondents' learning gains in their ICT instructional practices as manifested in their performance were revealed. Learning gains refer to the respondents' improvement in their ICT instructional skills after blended and face-to-face modes of learning. "Gains" as connoted by Fraenkel et al. (2013), are determined by subtracting the pretest score from the respondents' post-test scores. Table 5 displays that both face-to-face and blended learning yielded great increase in the development of ICT instructional skills of pre-service teachers. The similar increase in the learning gains was confirmed by the computed t-value (1.4962) with a probability of 0.1568 which shows that overall learning gains between the two modes of learning did not differ significantly. This finding discloses that general learning results achieved in face-to-face mode is comparable with the learning gains in the blended mode of learning. This result can be attributed to the extent of availability and functionality of ICT facilities used by the learners, readiness of the learners for blended learning, capability of teachers in the conduct of blended learning, and richness of learning experiences and instructional learning supports.

Further analysis of the results in Table 5 reveals that respondents who were exposed in face-to-face mode considerably exceeded those who were exposed in blended mode of learning along use of ICT for knowledge deepening, knowledge creation, and use of ICT to introduce a lesson. This finding shows that face-to-face learning mode has a bearing in the advancement of the pre-service teachers in their various ICT instructional practices. This can be attributed to the actual demonstrations and prompt assistance and technical supports provided during the learning sessions.

Knowledge deepening intends to increase ability of students, citizens, and the workforce to add value to society and to the economy by applying the knowledge gained in school subjects to solve complex, high priority problems encountered in real world situations of works, society and in life generally. Also, knowledge creation aims to increase productivity by creating students, citizens, and a workforce that is continually engaged in, and benefits from knowledge creation, innovation and lifelong learning (UNESCO, 2011). Use of ICT to introduce pertains to pre-service teachers skill in Engaging learners with the new lesson using multimedia; using multimedia to introduce a lesson; and, assigning learners to present the new topic using technology.

Table 5

Difference Between the Control and Experimental Groups' Extent of ICT Instructional Practices Before and After Blended Learning

Insructional Skills	Control Group Learning Gain (Face-To-Face Mode)	Experimental Group Learning Gain (Blended Learning)	t-stat	prob.
Technology Literacy	0.56	0.59	-0.6319ns	.5319
Knowledge Deepening	0.69	0.58	2.6051*	.0138
Knowledge Creation	0.78	0.64	2.7943*	.0143
Planning for ICT integration	0.57	0.48	0.9054ns	.4165
Use of ICT to Introduce	0.75	0.70	2.8841*	.0448
Use of ICT to Reinforce	0.70	0.48	2.7408ns	.0518
Use of ICT to Supplement	0.69	0.56	2.2981ns	.0831
Use of ICT to Extend	0.57	0.74	-1.1643ns	.3090
Overall Weighted Mean	0.66	0.60	1.4962ns	.1568

*ns= not significant   * =Significant   **= Highly Significant*

In contrast, Table 5 divulges similar improvements of ICT instructional skills of pre-service teachers along technology literacy, planning for ICT integration, use of ICT to reinforce, use of ICT to supplement, and use of ICT to extend learning. Technology literacy pertains to demonstration of basic skills in using ICT such as using common hardware, performing basic tasks in using computers and the internet. Planning for ICT integration relates to the pre-service teachers' skill in selecting materials/technology tools that are appropriate to the nature and needs of learners, and learning objectives; choosing materials that are available, cost efficient and time efficient; and developing information and media literacy skills among students. Use of ICT to reinforce pertains to pre-service teachers' skills manifestation in designing ICT-based learning activities that reinforce learners higher order thinking skills, collaborate using technology and designing ICT-based learning activities that will strengthen the understanding of concept. Use of ICT to supplement relates to the respondents' skills in providing learners with digital/non digital reading resources to supplement the lesson; using multimedia to augment the lesson; and providing internet-based or computer assisted instruction to broaden students' knowledge and skills about the subject matter. Lastly, use of ICT to extend learning concerns designing learning activities that will allow learners to explore the use of technology for discovery and constructivist learning. Students are allowed to select and analyze enrichment lessons using technology in ways that broaden their problem-solving skills.

These research findings reveal the complementary roles between blended and face-to-face modes of learning. This result supports the claim of Garrison and Kanuka (2004) that combining face-to-face and online learning can result in a transformative learning experience for students.

Based on the results of the study, a model for blended learning is being proposed (Figure 3). It contains three phases. The first phase includes an analysis of the learners, statement of learning outcomes, selection of methods and preparation of media supports for blended learning. Second phase is the implementation phase which covers application of appropriate strategies for blended learning and utilization of technology support. Engaging learners to actively participate in the process of blended learning and monitoring learning progress. The final phase is evaluation of learning outcomes. This is tailed by necessary enhancement or revision to better improve the blended learning process.

Result of the evaluation may show specific weakness or threats that were identified in any of the phases. If these problems are not properly catered, they may hamper learning. Necessary feedback to address such problems can be done in any of the blended learning phases as appropriate to achieve learning objectives. The proposed model can be cyclic. After the evaluation phase, the teacher may start a new blended learning experience.

Figure 3. Model for blended learning
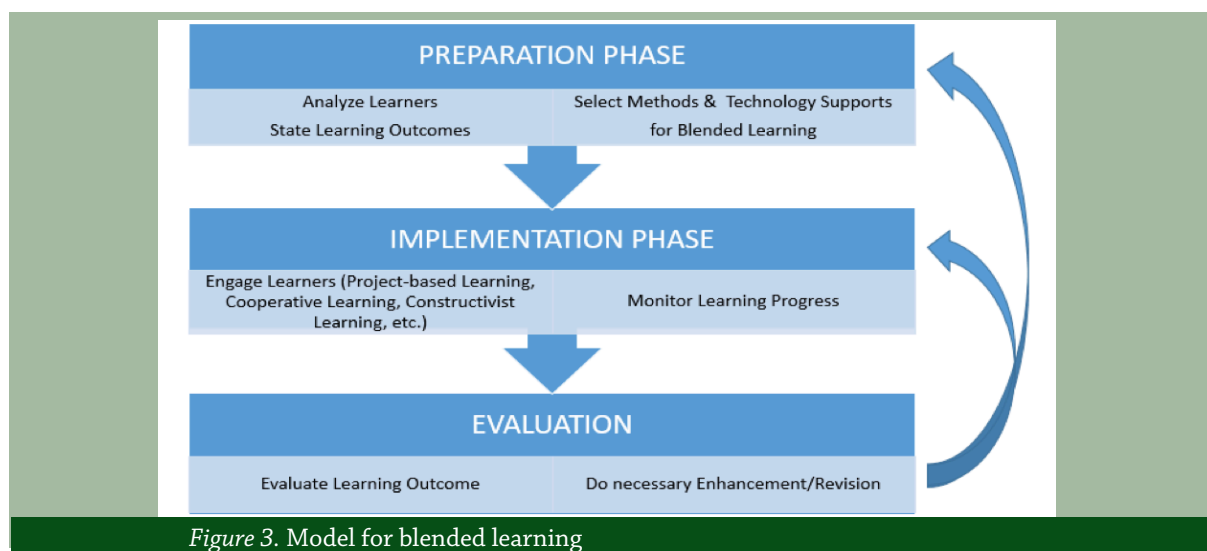
Conclusions

Both face-to-face and blended modes of learning progress the ICT instructional skills development of pre-service teachers. Improvements in ICT instructional skills are evident along technology literacy, knowledge deepening, knowledge creation, use of ICT to introduce, use of ICT to extend learning, planning for ICT integration, use of ICT to reinforce, and use of ICT to extend. Regardless of mode of learning, achieved learning gains in general are comparable. Face-to-face and blended modes of learning are complementary in terms of developing the pre-service teachers' ICT instructional skills.

Recommendations

Based on the results and conclusions of the study, it is recommended that teacher education institutions consider the possibility of integrating blended learning in their curricula. This can be integrated in professional education and general education courses that require the development of ICT skills of the pre-service teachers. Moreover, TEI teachers are encouraged to expose pre-service teachers to both face-to-face and blended learning to better enhance their ICT instructional skills that may serve as basis for managing alternative learning in their future careers as teachers.

Training-workshops on the preparation and facilitation of blended learning sessions may be conducted to both TEI teachers and pre-service teachers. The proposed model for blended learning may be adopted in the conduct of blended learning. Finally, the proposed model can be tested and validated for its wide range use in the different levels of education.

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