

Blended learning model on hands-on approach for in-service secondary school teachers: Combination of E-learning and face-to-face discussion

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Abstract The purpose of this study was to examine the effectiveness of a blended learning model on hands-on approach for in-service secondary school teachers using a quasi-experimental design. A 24-h teacher-training course using the blended learning model was administered to 117 teachers, while face-to-face instruction was given to 60 teachers. The following dependent variables were compared: degree of learners' knowledge, self-efficacy and satisfaction with the training course. The results indicated that the experimental, blended learning group showed a significantly higher level of knowledge of hands-on approach and overall satisfaction with the course. However, the self-efficacy and others items related to learner's learning satisfaction were similar between two groups. Moreover, the findings indicated that access, flexibility, cost effectiveness, improving interaction, formation of teacher network and involving of administrators, instructors and school leaders were factors which contributed to the success of blended learning model. Further implications and suggestions for the blended learning model are presented.

Keyword Teacher professional development · Blended learning · Teacher training course · Hands-on approach · Secondary school teacher

1 Introduction

The rapid development of computer, communication and Internet technologies in education has paved the way to the emergence of new teaching and learning environments and methodologies such as online learning, teleconferencing, web-based distance learning, computer assisted learning and blended learning... In recent years, studies revealed that students learn as successfully in online environments as in traditional face-to-face (F2F)

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classroom settings (Donnelly 2010; Woltering et al. 2009). However, the online learning approach has limitations, such as separation, confusion, isolation, limited feedback, and lack of responsibility (Kelly et al. 2009); lack of face-to-face interactions with teachers and peers in online learning (Arbaugh and Duray 2002). Consequently, educators have combined F2F instruction with online learning components in a blended learning (BL) modality. BL becomes an important alternative modality for reducing the limitations of both F2F and online learning because BL adopts the advantages of both types of learning (Graham 2005). According to Means et al. (2009), a meta-analysis and review of online learning studies conducted from 1996 to 2008 identified that the outcomes for BL to be significantly better than either face-to-face or fully online modalities. Other studies argued that BL increased access and flexibility (Macedo-Rouet et al. 2009), and increased the cost and time effectiveness of learning (Dziuban et al. 2004).

To present, the interest in and research on BL in the context of teacher education have increased and developed respectively. However, empirical studies on BL for teacher professional development are limited (Keengwe and Kang 2012; Means et al. 2009; Owston et al. 2008; Young and Lewis 2008). From these trends, therefore, three questions have emerged. First, could a teacher-training course based on the BL model enhance learners' knowledge and self-efficacy on hands-on approach (HOA)? Second, what is the learners' satisfaction level with the BL model? Third, if BL model is effective, what are the underlying factors that contributed to the success of the BL model? The purpose of this study, therefore, was to determine the effectiveness of the BL model to deliver the HOA course in comparison to delivering the same course content by the same instructor in the form of F2F lectures for Vietnamese secondary school teachers (SSTs).

The rest of the paper is organized as follows. The related literature is presented in Section 2. Section 3 reviews the BL model for teacher professional development (TPD). The aims and methodology of the study are presented in Section 4 and Section 5. Section 6 presents the findings of the study. Finally, discussions and conclusion are given in Section 7 and Section 8.

2 Related literature

2.1 BL in teacher education

BL is rapidly emerging as a domain of practice and of research and it is being used with increased frequency around the world (Halverson et al. 2014). According to Graham (2013); Strauss (2012); Garrison and Vaughan (2011), BL is a combination of online and face-to-face instruction. It is used to describe a learning situation that combines several delivery methods with the goal of providing the most efficient and effective instruction experience (Harriman 2004); It can maximize benefits of both F2F and online methods (Garrison and Vaughan 2011); It increases the cost and time effectiveness of learning (Dziuban et al. 2004); It improves student's motivation and participation (Ugur et al. 2011).

To present, many studies have been conducted to examine different aspects of BL in teacher education (Halverson et al. 2014). In the teacher professional development (TPD) field, Oliver and Trigwell (2005) argued that BL provided an effective model for meeting the needs and learning styles of busy teaching professionals because it allows for a more flexible study schedule than a lectures-only course. Oliver and Trigwell (2005) described and

illustrated how a BL environment in an education course can be designed around authentic learning experiences to bring meaning to learners' activities. According to Motteram (2006), BL model not only helps teachers to develop relevant skills through F2F sessions, but also provides them with an opportunity to reflect on an online forum about their practice.

Young and Lewis (2008), King (2002) and Motteram (2006) examined the perception of teachers in blended teacher education programs and concluded that they had positive ideas about blended education in terms of overall satisfaction and enjoyment. In another study, Owston et al. (2008) reported that a blended program for middle school mathematics and science teachers positively influenced teacher attitudes and content knowledge on specific curricular topics, and motivated many teachers to transform their classroom practice. Holmes et al. (2005) and Voogt et al. (2005) analysed blended courses of TPD programs for SSTs, which focused on integrating technology into teachers' practices. These studies suggested that blended programs could help teachers better understand and implement technology into their classrooms and, to a lesser extent, adapt exemplary materials for their own settings.

Although BL has integrated into various teacher education programs such as biology education (Saunders and Klemming 2003), human services education (Adcock et al. 2006), and science education (EL-Deghaidy and Nouby 2008; Liang and She 2006); the researchers' knowledge (Kupetz and Ziegenmeyer 2005), however, the studies of BL on HOA for secondary school teachers are limited.

2.2 Hands-on approach (HOA) in Vietnam

HOA is an inquiry-based science education approach to teaching and learning science (Worth et al. 2009). HOA plays a crucial role in today's education because (1) it ensures that students truly understand what they are learning, not simply learn to repeat content and information (Worth et al. 2009), (2) it encourages students' creativity in problem solving, promotes student independence, and helps low-ability students overcome initial handicaps (Shymansky and Penick 1981), (3) and it enhances reading readiness skills and oral communication skills among children (Barufakdi and Swift 1997).

HOA was launched in 1996 at the initiative of Georges Charpak, Nobel Prize in Physics in 1992, Pierre Lena, Yves Quéré and the Academy of Sciences-Institute of France in order to renovate the teaching science and technology in primary schools by promoting education based on a scientific investigation (Abrams et al. 2008). To date, the experience and expertise of HOA have spread among more than 35 countries including China, Brazil, Argentina, Belgium, Cambodia, Cameroon, Chile, Colombia, Egypt, Germany, Morocco, Senegal, Serbia, Slovakia, and Vietnam ... (Abrams et al. 2008).

In Vietnam, the Ministry of Education and Training (MOET) have launched a program of HOA in 2011. The aim of the program was to enhance the effective applying for HOA in the instruction practice of the experimental science subjects for primary and secondary school levels (Ministry of Education and Training 2011). The program emphasized that the HOA is an experience instruction approach, and that the nature of these experiences may be affected by school education and especially teacher behaviour (MOET 2011). Teacher behaviour is profoundly influenced by a teacher's professional knowledge (Borko and Putnam 1995) and self-teaching efficacy (Aguirre and Speer 2000; Albion 2001). In order to apply successfully HOA in instruction practice, therefore, teachers' knowledge and self-efficiency on HOA need to be improved.

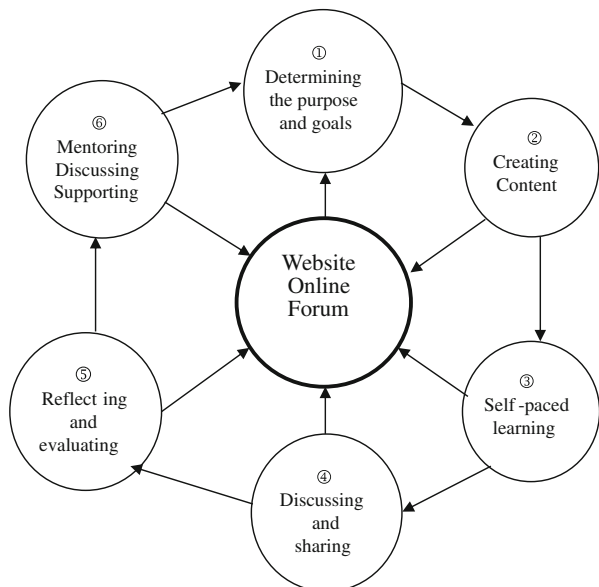
To present in Vietnam, several HOA courses for in-service secondary school and primary school teachers have been delivered through the F2F form. According to Russell et al. (2009), the F2F learning form allows the learners and the instructors interact with each other easily. However, it has limitations such as it requires a lot of human resources, time, cost and facilities to deliver in a wide scale (Russell et al. 2009). The above situation indicates the urgent need to have an effective TPD model for the nationwide delivery of HOA.

3 Teacher professional development (V-TPD) model

The V-TPD model is a knowledge management-based TPD model in BL environment, which was proposed by the researcher in 2013. Ho et al. (2013) argued that teacher's professional is developed effectively based on four key knowledge management modes namely knowledge co-creation, knowledge internalization, knowledge sharing, and knowledge evaluation. The model could be implemented as a teacher-training course by the following stages (Fig. 1).

- Stage 1: *Determining the purposes*: The course's purposes are determined based on the MOET's strategies, teachers' needs, and instruction context. They are fundamental factors to provide the necessary supports for implementation, management, and operation process of the V-TPD model.
- Stage 2: *Creating the contents*: The knowledge of the TPD model is co-created by the interaction between instructors and learners; instructors and materials; learners and learners. The knowledge is evaluated by educational experts and experienced teachers and approved by the MOET. Next, the knowledge will be converted into materials for TPD courses such as learners' learning materials, instructors' mate-

Fig. 1 V-TPD model (Ho et al. 2013)



- rials, and supplementary materials. All of them will be available for all participants.
- Stage 3: *Self-paced learning*: With the user information provided, the learners log on to the learning system to gain access to the learning materials such as the study guideline for learners (how to study, how to do the assignments, how to participate in online-discussions, learning timeline...), video-clip of lectures or teaching situations, and other resources. In this learning process, the learners can chat, e-mail, or discuss online with their peers and instructors.
 - Stage 4: *Discussing and sharing*: During learning process, learners join an online forum to discuss and share their opinions with their peers group and facilitators about the training course contents. Next, they have to attend F2F sessions according to the schedule of the course. F2F session begins with an introduction on the discussion direction and the coursework to be completed. After that, the participants will discuss in small groups. The participants will present, observe and evaluate peers' presentations in the groups. The purpose of the stage is to give for learners opportunities to work hands-on by collaborating with their peers, share their experience, and learn from peers' products.
 - Stage 5: *Reflecting and evaluating*: The learners have to do assignments with their group and post their reflective journal on the online forum. The learners also have to take online tests. The evaluation of learners' performance is based on the results of their works in all stages and the online tests as well as the results of final products. The learners will receive a participation certificate after the end of the course. A summarized evaluation of the course is sent to the educational instructions as a reference for further TPD courses.
 - Stage 6: *Mentoring, coaching, and supporting*: The TPD process is continued by on-going interaction among community's members via the online forum. The learners could raise new questions that related to the TPD course or that occurred in the instruction practice. They could receive the on-going supports from the community members. These supports become lessons not only for questioners but also for all other members. As a result, a learning community as a teacher network are established and the network which helps learners in developing their professional skills and identity as a teacher.

4 Aims of the study

The aims of this study were to examine (1) the effectiveness of the V-TPD model on in-service SST's knowledge and self-efficacy of HOA, (2) the participants' satisfaction level and (3) the underlying factors that contributed to the success of the V-TPD model.

5 Methodology

5.1 Experimental design

This was a quasi-experimental study with a non-equivalent groups design. Traditional F2F classroom training and BL model-based course utilising a combination of e-learning components and discussion was administered to control and experimental groups.

5.2 Participants

The course's participants were in-service secondary school teachers (SSTs) and the staff of Departments of Education and Training (DoET) of four provinces in Vietnam, namely Hai Duong, Hoa Binh, Thai Nguyen, and Yen Bai. The number of participants attending the course was 177, of whom 117 participated in the BL model (i.e. they received the training materials, self-paced learning, sharing, discussing and attending a F2F session). And 60 attended by F2F lectures only (i.e. they attended a F2F course in the classroom). The participants attending the BL model can use computer well. The number of participants belonging to each group is as follows (see Table 1).

5.3 Instruments

This study employed a mixed-method design involving both quantitative and qualitative research methodologies (Greene and Caracelli 1997). To answer the research questions, the instruments, administered in Vietnamese were developed by the authors of this study and instructors of the course: achievement tests (teacher's knowledge of and teaching self-efficacy of HOA); learner's satisfaction scale; successful factors scale; and E-learning platform of the Hanoi National University of Education (HNUE) (<http://elearning.giaoducphothong.edu.vn>).

In order to develop the study's instruments, relevant existing instruments and literature were reviewed. Validity of the instruments was determined by content-related validity. In general, the content-related evidence demonstrates the degree to which the items on an instrument are representative of a domain of content. To establish content validity for this study's instruments, a group including the researcher and instructors come from the HNUE, Hanoi College of Education (HCE) reviewed each item to ensure constructing an instrument that reflected the domains of interest. Suggestions for modifications on some of the items and scales were provided by the group. This included rephrasing items and deleting others that seemed repetitive. After carrying out the necessary modifications, the group reported that the instruments were appropriate for the study and that the language was clear. All instruments, except the open-ended questions, were piloted with a group of 20 SSTs, who will not attend the course to ensure reliability.

Later, the instruments were administered to SSTs in the original study representing the two groups, experimental and control. Once at the beginning of the HOA course, taught by the researcher (Fig. 4), as pre-tests and then re-administered at the end of the term as post-test.

The HNUE's E-learning platform consists of the following modules: information management, course management, online forum, assessment management, and user management (Fig. 2).

Table 1 Number of participants attending the TPD course

Provinces	Experimental group ($n=117$)	Control group ($n=60$)
Hai Duong	29	
Hoa Binh	31	
Thai Nguyen	36	30
Yen Bai	21	30

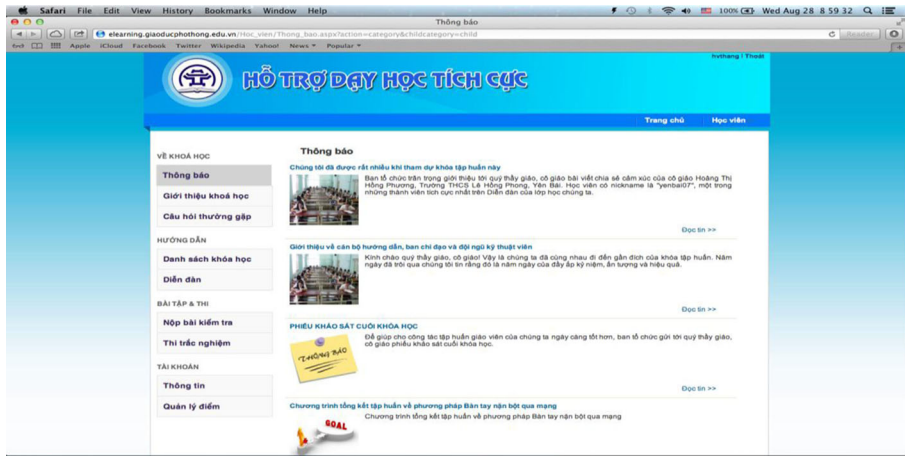


Fig. 2 Home page of E-learning platform

5.3.1 Achievement test

The learners’ achievement including knowledge and teaching efficacy of HOA were analysed based on sub-scores gained through assignments during the learning process, and a post-test was taken into consideration to evaluate learners’ achievement levels. A variety of formats such as true/false, multiple choice. All types of questions required that answers be justified. SSTs participating in both groups administered the final course test within a time frame (45 min) calculated in the pilot testing stage (average time for answering test questions). The final course test was administered to the control groups in a paper-and-pencil format, but was given to the experimental group via an online test system.

5.3.2 Learners’ satisfaction scale

A literature review related to learners’ satisfaction of BL model was conducted before developing a learners’ satisfaction scale for this study. This scale is developed based on an adaptation of the questionnaire of Arbaugh (2000). The scale is composed 6 questions, where learners are asked to check their level of agreement with each item using a five point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questions and learners’ responses summarized are showed in the Section 6.

5.3.3 Successful factors scale of V-TPD model

The instrument employed to examine underlying factors that contributed to the success of the BL delivery method was a reflective questionnaire, which consisted ten open-ended questions. The questionnaire was developed by the researcher. The questions and learners’ responses summarized are showed in the Section 6.

5.4 Experimental procedures

The contents of the 24 h-teacher-training course on HOA for the in-service SSTs were co-created by the collaboration between educators from the HNUE, HCE and

experiential SSTs. Then, the contents were evaluated and approved by the Department of Secondary Education (DSE) of MOET. The course contents were organized into the following modules:

- (1) History of HOA;
- (2) Fundamental theory on HOA;
- (3) Instruction skills of HOA;
- (4) How to apply HOA in the instruction practice.

The study period was from June 1st 2013 to September 30th 2013.

The procedures of participation in the teacher-training courses of both groups are described as follows.

- *Experimental group*: On the first day of the course, participants attended an opening ceremony (Fig. 3). In the ceremony, participants guided how to participate in teacher-training activities. Then, they took the pre-test (Fig. 4) and they determined their group by themselves (3–4 learners/group in the same subject). In the learning process, participants had to read an introduction of the course and then study follow their self-paced learning. The learners have enough time to apply what they learned into their teaching practices before discussing and sharing their ideas with the peers in the group. They could obtain feedbacks from facilitators and peers. On the last day of the course, the learners had to present their products/ assignments and received comments/advices from other participants in the morning. Then they attended a closing ceremony in the afternoon, which was a video-conferencing under the chairmanship of the officials of MOET and DOET as well as participating in all trainees from 4 provinces (Fig. 5). In this event, the



Fig. 3 The opening ceremony of TPD course in Hoa Binh province

participants shared challenges that they met during attending the course. And they exchanged their ideas about how to deal with the difficulties when applying the HOA into teaching practice. The participants received responses from the deputy minister, MOET's officials, and instructors.

- *Control group*: The learners participated in a F2F classroom course at the Departments of Education of two provinces. On the first day of the course, learners attended an opening ceremony, and then they took the pre-test. During the training process, learners listened lectures, worked hand-on and collaborated with their peers in small groups based on assignments/products. On the last day of the course, the learners have to present their assignments/products, took the post-test, and then attended the closing ceremony together with the experimental groups (Fig. 5).

The TPD courses' contents, learning materials, evaluation requirements, and instructors of the TPD course for both groups were the same.

5.5 Data analysis

The collected data were analysed using the SPSS software. Demographic characteristics were analysed by descriptive statistics, and the homogeneity of the experimental and control group was analysed by the independent samples *t*-test. An independent samples *t*-test (which is a parametric statistics test) was used to analyse the results. The reliability of the measurement tools was verified using Cronbach's α coefficient. A probability value of $p < 0.05$ was considered indicative of statistical significance. The statistical power for the study was 0.83 with $\alpha = 0.05$ for a large effect size ($d = 0.80$) based on an independent *t*-test in each group.

The qualitative data were collected through the feedback questionnaire in which the blended group was asked ten questions about the blended instruction they received.

6 Results

6.1 Demographic characteristics

The demographic characteristics and results of the homogeneity test are listed in Table 2. In both groups, the majority of participants attending the training course were female, with the percentage of experimental and control groups being 74.4 % and 73.3 %, respectively. The percentage of the learners aged 30–40 in the experimental and control groups were 51.3 % and 56.7 %, respectively, while in both groups these percentages were much lower for other ages. The majority of learner had bachelor and associate degrees, with the percentages in the experimental and control groups being (72.6 % and 61.7 %) and (26 % and 22.2 %), respectively. The SSTs numbers participating in the course were the highest, and the percentages of them in the experimental and control groups were 90 % and 73.3 %, respectively. The percentages of learners who were teachers of Physics, Chemistry, and Biology for the experimental group were 35.5 %, 39.3 %, and 23.9 %, respectively, and these for the control group were 30 %, 28.3 % and 31.7 %, respectively.

Table 2 Demographic characteristics

Categories		Experimental group		Control group	
		<i>n</i> =117	(%)	<i>n</i> =60	(%)
Gender	Male	30	25.6	16	26.7
	Female	87	74.4	44	73.3
Age	Under 30	4	3.4	4	6.7
	30–40	60	51.3	34	56.7
	41–50	37	31.6	13	21.7
	Over 50	16	13.7	9	15.0
Academic degree	Associate	26	22.2	21	35.0
	Bachelor	85	72.6	37	61.7
	Master	6	5.1	2	3.3
Teaching experience	1–4 years	7	6.0	12	20.0
	5–15 years	68	58.1	34	56.7
	16–25 years	33	28.2	11	18.3
	+25 years	9	7.7	3	5.0
Field of expertise	Physics	41	35.5	18	30.0
	Chemistry	46	39.3	17	28.3
	Biology	28	23.9	19	31.7
	DoET's staff	2	1.7	6	10.0

6.2 Effects of education

Table 3 lists the compared results of learners' knowledge between the experimental and control groups for the pre-test and post-test. There was an increase in mean score of learners' knowledge of both groups between the pre-test and post-test. There was no statistically significant difference for the learners' knowledge between both groups before attending the course ($t=0.643$, $p=0.521$). The mean scores of knowledge in the pre-test of experimental and control groups were (14.97 SD = 1.950) and (15.57 SD = 1.170). However, there was a statistically significant difference from learners' knowledge of HOA between two groups after attending the course with $t=8.556$ and ($p=0.000<0.05$). The mean score for knowledge in the post-test of the experimental group was 21.89 (SD = 3.232), while that of the control group was 18.23 (SD = 2.360).

With regard to participants' self-efficacy of HOA, there was an increase for the mean score of learners' self-efficacy in both two groups between the pre-test and post-test (see Table 4). There was no difference for self-efficacy between two groups in the pre-test ($t=0.604$, $p=0.547>0.05$), with mean score of the experimental and control groups being (10.93 SD = 1.809) and (10.77 SD = 1.533), respectively. Similarly, there was no significant difference in mean score of self-efficacy of two groups in the post-test ($t=1.674$ and $p=0.96>0.05$). However, the mean score of the control group was higher than that of the experimental group (14.73 SD = 1.149 and 15.03 SD = 1.164).

Table 3 The pre-test and post-test results for learners' knowledge of HOA

Category	Experimental group ($n=117$) Mean \pm SD	Control group ($n=60$) Mean \pm SD	t	p
Knowledge of pre-test	14.97 \pm 1.950	15.15 \pm 1.147	0.643	0.521
Knowledge of post-test	21.89 \pm 3.232	18.23 \pm 2.360	8.566	0.000

6.3 Learner's satisfaction with teacher-training course

Table 5 lists the results of the comparisons of learners' satisfaction between the experimental and control groups of the post-test. With regard to item 'overall satisfaction with the course', the mean score of the experimental group (4.32, SD = 0.554) was higher than that of the control group (3.97, SD = 0.450), with a statistically significant difference ($p=0.000<0.05$). Similarly, in the item 'information is fully provided', mean score of the experimental, and control groups were (4.25 SD = 0.540) and (3.72 SD = 0.666), respectively, with a statistically significant difference ($p=0.000<0.05$).

The mean scores of the experimental and control groups for the following questions 'participating the course in the future', 'help in job performance', 'understanding of education', and 'would like to recommend this course to others' were 4.21 (SD = 0.565) and 4.03 (SD = 0.637); 4.36 (SD = 0.533) and 4.13 (SD = 0.503); 4.17 (SD = 0.557) and 3.97 (SD = 0.520); 4.42 (SD = 0.529) and 4.30 (SD = 0.530), respectively, with no statistically significant differences between two groups.

6.4 Factors improve learners' knowledge and self-efficacy in V-TPD model

To further understand the underlying factors that contributed to the effectiveness of the V-TPD model on improving the learners' knowledge, self-efficacy and satisfaction on HOA, ten open-ended questions were included in a reflection questionnaire. Which were delivered to the experimental group. Content analyses based on the participants' responses were analysed and the frequency of each response was calculated. The results of these content analyses are presented in Tables 6, 7, 8, 9, 10, 11, 12, 13, 14, and 15

Q.1. This course was aiming to enhance knowledge of the HOA used for instruction?
Did the course succeed in doing? If yes, how?

Most participants (98 %) agreed that the course improved their knowledge of HOA. The primary reasons enhanced their knowledge of HOA were online-lectures (60 %), supplementary materials (51 %) and discussing and sharing

Table 4 Pre-test and post-test results for participants' self-efficacy of HOA

Category	Experimental group ($n=117$) Mean \pm SD	Control group ($n=60$) Mean \pm SD	t	p
Self-efficacy of pre-test	10.93 \pm 1.809	10.77 \pm 1.533	0.604	0.547
Self-efficacy of post-test	14.73 \pm 1.149	15.03 \pm 1.164	1.674	0.960

Table 5 Satisfaction degree of the learners with the courses

Category	Experimental group (<i>n</i> =117) Mean ± SD	Control group (<i>n</i> =60) Mean ± SD	<i>t</i>	<i>p</i>
I am satisfied with overall the course	4.32±0.554	3.97±0.450	4.624	0.000
I would like to participate in other courses in the future	4.21±0.565	4.03±0.637	1.823	0.069
The course help me to perform my teaching duties better	4.36±0.533	4.13±0.503	2.278	0.060
The content is easily understandable	4.17±0.557	3.97±0.520	2.305	0.220
All information that I required is fully provided	4.25±0.540	3.72±0.666	5.342	0.000
I would recommend this course to other learners	4.42±0.529	4.30±0.530	1.413	0.159

with peers (40 %). Meanwhile, the reasons which improved learners' knowledge through observing peer' product, giving feedbacks and mentoring being 13 %, 6 % and 5 % respectively (see Table 6). Example of responses the question as follows.

'I could learn from my learning experience such as observing, discussing, giving feedbacks'.

'Through the online forum, we could share and exchange information and assignments with peers which can help me improve my knowledge of HOA'.

"I could learn from the peers' feedbacks"

'I could learn from peers' mistakes'.

'I can learn through observing peers' products/assignments'.

Q2. This course was aiming to enhance self-efficacy of HOA used for instruction? Did the course succeed in doing? If yes, how?

A significant majority (98.3 %) responded positively that the course enhancing their self-efficacy of HOA in instruction. The primary reason for these responses were lectures of instructors (50 %), doing assignments (26.5 %), exchanging and discussing (30 %) and working in group (20 %) (see Table 7). Examples of responses to the question are as follows.

'This model can help me improve my self-efficacy because through doing in teamwork'.

'I can improve my self-efficacy by observing, discussing, giving feedbacks and sharing with my peers'.



Fig. 4 Attending the online pre-test

‘I can improve my self-efficacy by attending online-lectures, and doing assignments’.

‘My efficacy can improve through work in-group by hands-on activities’

‘My facilitators and mentors can help me improve my self-efficacy’

Q3. Did the assignments of sharing and commenting on products contribute to your understanding and appreciation of how to use effectively HOA in classroom? How?

Significant majority (95 %) of participants agreed that sharing and commenting for products, which contributed to their understanding and appreciation of how to use HOA effectively in classroom. The reasons for that were from peers feedbacks (33 %),

Table 6 Q1 content and analysis

Response	Percentage
Yes	98.3
Reasons (yes)	
Online lectures	60.0
Materials	51.0
Discussing and sharing with peers	40.0
Observing template and peers products	13.0
Evaluating and feedbacks	6.0
Mentoring	6.0

Table 7 Q2 content and analysis

Response	Percentage
Yes	98.0
The reasons (yes)	
Lectures of instructors	50.0
Doing assignments	26.5
Exchanging and discussing	30.0
Working in group	20.0
Observing from peers	11.0
Coaching and mentoring	15.4

peers observing (10 %), peers' mistaking (6.8 %) and exchanging and sharing ideas (5.1 %) (see Table 8). Examples of responses to the question are as follows.

'I can learn a lot from comments for assignments'

'Instructors and peer's feedbacks help me understand my mistakes'.

'I can improve my knowledge when observing peers' products/lesson planes'.

Q4. Can you comment on the discussions and feedback from online discussion topics? Were you able to ask sufficient questions? Did you have sufficient opportunity to give input? Did you receive sufficient feedback? Were the discussions useful?

Most learners (93 %) joined the online forum for discussing and receiving and giving feedbacks. 82 % responded that the online forum was useful for their learning experiences. The percentage of learners raising questions on the online forum was 76 %. Meanwhile, 74 % received the responses from their peers and facilitators (see Table 9). Examples of responses to the question are as follows.

'I joined the online forum to discuss with my peers'.

'I gave some questions and I received the responses from other members timely, which helped me improve my leaning motivation and knowledge'.

Table 8 Q3 content and analysis

Response	Percentages
Yes	98.0
The reasons (yes)	
Feedbacks	33.0
Peer observing	10.0
Peer mistaking	6.8
Exchanging and sharing ideas	5.1

Table 9 Q4 content and analysis

Response	Percentages
Joint the online forum give and receive feedback	93.0
Forum is useful for learning experiences	82.0
Raising questions on the online forum	76.0
Receiving feedbacks from peers and facilitators	74.0

‘I had problems in talking in front of the class, but with the use of discussion forums in TPD system, I felt relieved’.

‘I did not receive responses for all my questions. However I can learn from the questions and answers of other members. I think the forum is useful for all members’.

Q5. Did the course provided enough time for you to reflect on your abilities and competency of applying HOA in classroom?

Significant majority (98 %) of participants indicated that the reflection time of the course was enough for their studying (see Table 10). Examples of responses to the question are as follows.

‘I have enough time for applying what I learned into classroom practice before discussing with peers. While in traditional course, I do not have enough time for covering the required educational content and reflective activities’.

‘I have enough time for reflecting about my lectures’.

Q6. How do you feel about the learning process (e.g. materials, organizing) in this course?

76.1 % of learners reflected that the course was well organized. All materials and resources needed to complete the class were readily accessible. Meanwhile 69 % indicated that the BL model is an effective format for teacher education. 72 % of SSTs believed the model is a promising form for TPD (see Table 11). Example of responses the question is as follows.

‘Blended course was fun and easier to learn especially the theoretical part of the field’.

Table 10 Q5 content and analysis

Response	Percentages
The course was enough time for reflecting	98.0
The learners can apply what they learn in teaching practice	81.0

Table 11 Q6 content and analysis

Response	Percentages
The course was very good on preparing	76.1
BL is an effective format for teacher education	69.0
BL is a promising format for TPD	72.0

‘Personally I like taking course in the classroom; however, I think that the courses I took online were also nice’.

‘I think the course were organized well and materials were available’

Q7. How do you feel about the flexible access in the new model? Why?

Ninety-one per cent of participants agreed that the model was flexible for TPD. Because they can learn anytime and anyplace (27 %), 11 % of respondents indicated that they could do other works while participating in the course. Participants also commented on the blended course’s convenience and flexibility (see Table 12). Examples of responses to the question are as follows.

‘I can do housework, or giving lectures at school when participating in the course of HOA’.

‘I can study anytime and anywhere’

‘The flexibility of classes fit my work schedules and I could complete assignments at my own pace’.

Q8. How do you feel about the time to participate in TPD course in the new model? Why?

The responses are summarised in Table 13. Examples of the question’s responses are as follows.

‘I think that I saved more time participating in the TPD course because I did not handing in their works at home and schools’.

‘I did not need to spend time travelling’.

Table 12 Q7 content and analysis

Response	Percentages
The V-TPD model was flexible for TPD	91.0
Reasons	
They can learn anytime and anywhere	27.0
They can do other works while participating in TPD course	11.0

Table 13 Q8 content and analysis

Response	Percentages
The V-TPD model could save the time	63.0
Reasons	
They did not handing in their works	57.0
They did not spend time traveling in order to participate in TPD course	11.0

Q9. How do you feel about the cost for participating in TPD course in the blended model?

The responses of the question are showed in Table 14. Examples of the question's responses are as follows.

'I could save money because I did not spend the cost travelling to teacher-training center of the province which is far from my home'

'I did not have to pay any cost for accommodation during the course'.

'I did not have to buy any TPD materials because they available on the website'

Q10. How do you feel about supporting, coaching and mentoring for you to participate in TPD course in the new model? Why?

55 % of the learners argued that they received enough supports, coaching, and mentoring during the learning process. 37.6 % of the learners believed that mentors and instructors were very enthusiastic. 22 % of participants indicated that facilitators helped them understand about their own ambiguity. 15 % of learners believed that instructors and facilitators helped them overcome challenges (see Table 15). Examples of responses to the question are as follows.

'I received supports and coaching timely when I had problems'

'The instructors and mentors were very enthusiastic and they helped me a lot.'

'Let us always be together, share information and help each other in professionals'

Table 14 Q9 content and analysis

Response	Percentages
The V-TPD model could save the costs	60.0
Reasons	
The learners did not spend any travel cost	29.0
The learners and their organizations did not pay any cost for accommodation	27.0
The learners did not buy any TPD materials	9.0

Table 15 Q10 content and analysis

Response	Percentages
The learners received enough support, mentoring and coaching	55.0
Instructor and mentors were very enthusiastic	37.6
The facilitators helped learners to understand their ambiguity	22.0
The instructors and facilitators helped the learners overcome challenges	15.0

7 Discussion

7.1 Education effects of the V-TPD model

The study findings indicated that there was a statistically significant difference of knowledge's mean score between two groups ($p=0.000<.05$) after attending the TPD courses. That suggests the effectiveness of the V-TPD on increasing learner's knowledge. The finding is consistent with the studies of Shea and Bidjerano (2010) and Means et al. (2009), that student of online communities of the blended course tend to provide better learning outcomes than traditional F2F course if appropriate technology is used and enough teacher-student interaction taken place. This finding could be due to the following related aspects.

First, this can be mainly due to the V-TPD model provided a flexible access to content and instruction. Findings from the qualitative data seemed to support this interpretation. 91 % of participants argued that the V-TPD model was flexible for learners on attending the TPD course. The learners could study at any time, from any place, by self-paced learning; they could do other works while participating in TPD course (question 7). Almost of learners (98 %) also emphasised that they have sufficient



Fig. 5 The closing ceremony of TPD course at MOET

time for reflection and applying what they learned into teaching practice (question 5). This is consistent with the research results of Vrasidas and Zembylas (2004) and Curtis and Swenson (2003), in which, online professional development could benefits for teachers including anytime, anyplace professional learning. Moreover, students in a previous study (Smyth et al. 2012) felt that the flexibility of BL fostered a sense of autonomy and supported them to take more responsibility for their learning (Rigby et al. 2012; Smyth et al. 2012)

Second, this can be due to the V-TPD model allowed enhancing participants' interaction. Finding from the survey data of the research supported this interpretation. The learner indicated that besides online lectures and materials, they could acquire their knowledge of HOA via interaction activities such as discussing, observing, sharing, exchanging, evaluating, and giving feedbacks with the peers and tutors (question 1). In addition 93 % of the learners of experimental group agreed that they could interact easily with their peers and instructors via the online forum and the F2F discussion session (question 4). Almost of participants (93 %) indicated that they could raise questions and receive responses from peers and instructions. Moreover, the learners also emphasized that the model gave them a chance for collaboration with peers through assignments. The findings of the present study supported the study findings of Kupetz and Ziegenmeyer (2005), they depicted that in-service teachers learned a lot from their peers when they reported back to their peers what they did while performing their practices.

Third, the V-TPD model allowed the formation of teacher network for professional development. The model becomes a bridge between SSTs and educational experts. This can be supported by the learner's responses that they could develop their professional with the supports, coaching, mentoring from the network's members through the online forum (question 2,3). This is consistent with Chapman et al. 2005, that teachers' professional could be developed through the fostering of a professional learning community. BL can help teachers within a university course structure to develop relevant skills through face-to-face sessions, while at the same time provide them with an opportunity to reflect online about their practice (Motteram 2006).

With regard to the learners' self-efficacy of HOA, the research finding indicated that learner's self-efficacy score tended to increase for both groups after attending the TPD courses. But there was no significant difference between them in the pre and post-test. That suggests the effectiveness of the V-TPD model. This result can be due to the positive novel experience of the experimental group through F2F and online discussion and collaboration in small groups. Moreover, the learners have sufficient time for reflection regarding what they learned and how to apply them into teaching practices. Findings from the qualitative data seemed to support this interpretation. That 98 % of the learners argued that the model help them improve their self-efficacy (question 2). Almost (98 %) of the participants agreed that the course provided enough time for their reflection (question 5). Moreover, the research revealed that the reasons which improved learner's self-efficacy were from online-lectures (50 %); exchanging and discussing with peers (30 %); doing assignment in groups (26 %); observing from peers (11 %) as well as from coaching and mentoring (15 %) (question 2). These results are in-line with study of Babenko-Mould et al. (2004) that there was no difference of self-efficacy of learners in BL education compared to traditional lecture or other types of education.

The finding indicated that the participant's self-efficacy result of the control group was higher than that of the experimental group. This indicated that learners could improve their self-efficacy better in the traditional-classroom course. This may be due to the direct guidance of instructors with learners on learning experience. The findings are consistent with the research results of Butrymowicz (2012) and Means et al. (2009), they claimed that learners of online courses receive fewer benefits from practical contents which can be modelled better in the classroom. For example course contents related to knowledge of classroom management.

7.2 Learners' satisfaction with the V-TPD model

The findings of the present research indicated that some items related to learner's satisfaction were similar between two groups, however, with respect to 'overall satisfaction with the TPD course' of the experimental group was higher than that of the control group. This finding may be mainly due to the fact that the participants of the experimental group were provided fully course's information and materials during the learning process. Moreover, it showed that the learners were convenient on participating in leaning activities and receiving the supports timely from peers and tutors.

Findings from quantitative and qualitative data seemed to support this interpretation. 93 % of participants of the experimental group joined the online forum and raised questions and received feedbacks from peers, mentors and instructors timely (question 4). Most of the learner (76 %) indicated that the course was organized well and the relevant information was provided fully. This finding coincides with the views of some theorists in the literature such as Dziuban et al. (2006), Bunderson (2003), Osguthorpe and Graham (2003) and Twigg (2003), who suggested that the blended format might result in greater student satisfaction. Young and Lewis (2008) argued that teacher candidates have generally positive response to BL in terms of overall satisfaction. BL improves student morale and overall satisfaction (Byers 2001).

7.3 Factors contributed to the success of V-TPD model

The qualitative data from participants' responses to the end of the course opening-question revealed various factors, which contributed to the success of V-TPD. And they were triangulated with quantitative data. These are the flexibility, access, cost effectiveness, improvement of interaction, formation of teacher network, and involvement of administrators, instructors and secondary school leaders.

The model provided a flexible and quality course. 91 % participants argued that the V-TPD model was flexible for learners on attending the TPD course. The learners could study anytime and anyplace by their self-paced learning, and they can do other works while participating in TPD course (question 7). This is consistent with the results of Vrasidas and Zembylas (2004) and Curtis and Swenson (2003), in which, online professional development could be beneficial them to learn anytime, anywhere. Moreover, students in a previous study felt that the flexibility of BL fostered a sense of autonomy and supported them to take more responsibility for their learning (Rigby et al. 2012; Smyth et al. 2012)

The model provided an access to TPD resources for learner. The qualitative data supported the interpretation: ‘I was provided fully important information and materials’. This coincides with Charalambos et al. (2004), that professional learners could improve through providing access to networks of professionals with useful skills and knowledge of TPD.

The model improved the opportunities for interaction between learners, instructors and learning contents. The finding revealed that the participants of the V-TPD model obtained knowledge not only from the online-lectures and materials, but also through activities such as discussing, observing, sharing, exchanging, evaluating, and giving feedbacks. 93 % of learners agreed that they could interact easily with their peers and instructors via the online forum and the F2F discussion session. The findings of the present study supported the study findings of Kupetz and Ziegenmeyer (2005), which depicted that in-service teachers learned a lot from their peers when they reported back to their peers what they did while performing their practices.

The model allowed the formation of teacher network for TPD. Through this teacher network, SSTs could develop their profession based on the supports, coaching, mentoring. This is consistent with Chapman et al. 2005, that teachers’ profession could be developed through the fostering of a professional learning community. Within a university course structure, BL can help teachers to develop relevant skills through face-to-face sessions, while at the same time provide them with an opportunity to reflect online about their practice (Motteram 2006).

The model increased the cost and time effectiveness. The findings of the study identified that relative to F2F, BL course reduced the traveling time and cost for participants (question 8 and question 9). On the other hand, the V-TPD model increased the cost-effectiveness of education through the ability repeating education course so that the model could reduce human resource as well as facilities. The data analysis supported for this interpretation, 72 % of participants of the course believed that the V-TPD model could become an effective model for TPD courses in a nationwide (question 6). This coincides with Means et al. (2009), that overall BL is more cost-effective than face-to-face programmes. BL could save significant costs through the reduction of substitute teachers and teaching assistants for faculty members (Twigg 2003).

The involving of administrators, tutors and school leaders were important factors on contributing to the success of V-TPD model. More than 50 % of participants argued that they received enough the supports, mentoring and coaching. They also agreed that instructors, school leader and facilitators helped them overcome challenges and ambiguity in learning process. Meanwhile, 76.1 % of participants argued that the course was very good on preparing. 69 % of learners thought that V-TPD model is an effective model for TPD.

7.4 Limitations of the study

The present study was limited by the difficulties of controlling exogenous variables that affected the effectiveness of the teacher-training courses, due to the limited number of the participants, and the unequal numbers of participant for each group. In addition, this study is weakened by a range of extraneous variables which could not be controlled including: the length of the course, which may have been short to fully elucidate the differences between the two formats of courses delivery methods; convenient sampling,

which may have introduced selection bias into the study because experimental group members who preferred to participate in the new type of teaching may have had higher motivation, and hence would exhibit better outcomes irrespective of the delivery method used; and the difference in instruction duration between the two groups, which could have been simply due to this difference in instruction duration, rather than to the difference in the delivery methods.

8 Conclusion

Based on the research presented in this paper, this study not only had significant practical implications for TPD in Vietnam, but also provided contribution to the current literature related to blended learning, computer-supported cooperative work in teacher's professional development.

First, the paper contributed to the growing empirical literature on the effectiveness of BL model on TPD for SSTs by using a quasi-experimental design of in Vietnamese context. The findings showed that the BL group has a significantly higher score of learns' knowledge and overall satisfaction with the course. However, there was no difference between two groups on the self-efficacy and other satisfactions.

Second, through collected data analysis, the research revealed that the success of the V-TPD model was based on the following factors: flexibility, access, cost effectiveness, improvement of interaction, formation of teacher network and involvement of administrators, instructors and secondary school leaders.

Third, it is suggested from the results of this study that (1) The V-TPD model is an effective model for TPD, so it should be considered for the nationwide delivery the HOA courses in the future. (2) The V-TPD model has just examined the effectiveness on HOA, so it should be examined more in other subjects; (3) This study just focused on in-service teachers, therefore, future studies should add follow-up research to investigate the influence of the model with pre-service teachers and its impact on student performances.

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