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Development of a Blended Learning Model on Anatomy and Physiology for Professional Nurses by Boromarajonani College of Nursing, Suphanburi, Thailand

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Abstract

The purpose of this research were to: 1) study basic information, opinions and needs for blended learning in anatomy and physiology study for professional nurses 2) study the development of the blended learning model for anatomy and physiology for professional nurses 3) propose an experiment for the use of the blended learning model for anatomy and physiology study for professional nurses 4) assess and revise the blended learning model for anatomy and physiology study for professional nurses. The researcher applied research and development rules and procedures and studied data systematically in order to construct the knowledge rehabilitation model for anatomy and physiology for professional nurses. The researcher applied blended research procedures by using qualitative research and quantitative research. The model was aimed at developing the knowledge of professional nurses working in hospitals. Data were collected from professional nurses who gave cooperation to participate in the research, divided into three sets as follows: Set 1: 15 people (Pilot Group 1), Set 2: 40 people (participants) and Set 3: 15 people (Pilot Group 2). Content analysis was conducted following the principles for synthesis, analysis, thinking and interpretation and statistical analysis was conducted with description of individual factors and paired sample t-test statistical analysis with reliability at 95% ($\alpha = 0.05$).The finding was showed professional nurses in three set who participated in the learning model had higher knowledge levels post-learning with statistical significance at 0.05. This means that the model can increase knowledge in anatomy and physiology in professional nurses and the satisfaction. Hence, indicating that the aforementioned modal is suitable for professional nurses, who want to use it to develop their anatomy and physiology knowledge.

Key Words: *Development model, Blended Learning, Anatomy and Physiology, Professional Nurses*

Introduction: Promotion and development of potential and rehabilitation of knowledge for nursing personnel is the primary mission of nursing educational institutions. Furthermore, academic promotion and support must be provided to ensure that professional nurses possess knowledge and abilities enabling them to keep up with education in the 21st century by providing education and teaching processes to support continuous development with the belief that promotion of content knowledge, specific nursing skills, expertise and literacy are highly essential variables in providing vital knowledge and skills (OBEC, 2016). The role of professional nurses is to share essential knowledge and skills with nursing students accurately and appropriately through promotion activities and review of knowledge consistent with education in the 21st century (Tuntirojanawong, 2017) with emphasis on life-long human learning and appropriate use of technology to ensure that students can learn continuously while finding entertainment in the process (Nilsook & Wannapiroon, 2012). Blended learning is an internet-based learning process that is widely used (Allen & Seaman, 2005; Wannapiroon & Nilsook, 2016). This type of learning is appropriate and consistent with the modern age, while being suitable for every age group, including adult learners. Furthermore, it is not necessary for learners to sit and listen to lectures only in the classroom. Instead, it is distance learning with minimal face-to-face contact and eliminates distance

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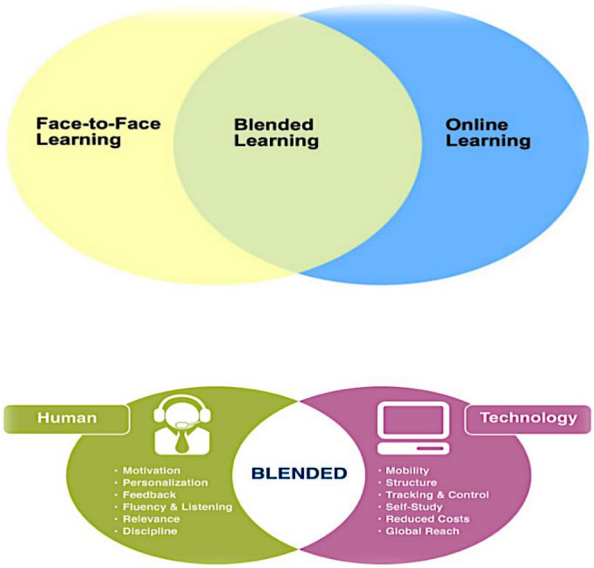
limitations in a way that allows learners to learn anywhere inside and outside the classroom (Allen, Seaman & Garrett, 2007) thereby leading to a wide range of learning and inquiry (Allen & Seaman, 2005). Blended learning in professional nursing is a means to promote learning outcomes and boost nursing capabilities in the clinic (Sathuwong, 2015).



Picture 1 Blended learning concept source: Allen and Seaman (2005)

Anatomy and physiological knowledge are foundational knowledge every professional nurse needs to learn and study. Accordingly, anatomy and physiology for nurses is a subject concerned with the cells, tissues and body structure as well as the skeletal, muscular, nervous, circulatory, respiratory, digestive, urinary, endocrine and reproductive systems. Because these are the interrelated working mechanisms of the human body, knowledge about anatomy and physiology are important components for ensuring that professional nurses successfully perform their nursing role in line with professional nursing standards (Poltana et al., 2018). However, upon completion of professional nursing education and while working in patient wards, one problem encountered is that nurses perform nursing procedures based on familiarity, and some might fail to consider anatomy or physiology in their nursing activities or procedures. Moreover, they lack the time to read and review their knowledge, so nurses forget anatomy and physiology after working for several years.

Concerning the circumstances of the need for anatomy and physiology knowledge in performing nursing procedures, it is important and necessary for professional nurses to apply knowledge in an integrative manner to ensure correct and safe nursing practices for patients. In addition, in the role of supervisors and teachers at practice centers for nursing students, it is necessary for them to function as preceptors to provide nursing knowledge and skills practice for nursing students as they practice in hospitals. Therefore, these professional nurses must act as good academic role models.

The development of learning models is an academic service mission to which nursing education institutions should give importance in order to develop the potential of professional nurses. In addition to influencing the development of the potential of professional nurses in providing correct and safe services for patients in responding to knowledge needs, nursing education management quality also influences Year 2-4 bachelor of nursing students. Therefore, education and the development of learning models for anatomy and physiology in a model capable of facilitating learning in terms of time and place should be researched based on the aforementioned issues. The creation of an anatomy and physiology learning model means the creation of the required model for facilitating learning in professional nurses, who have significant limitations in terms of heavy workloads, limited spare time, travel limitations and others. Hence, the researcher wanted to research and study a model that is facilitative and suitable to the modern learning context and consistent with the target group of professional nurses. Thus, the development of a learning model for anatomy and physiology for nurses is research aimed at developing knowledge involving technology in teaching in line with the present situation. The researcher applied constructivism in learning instruction (Duffy, Lowyck, Jonassen, & Welsh, 1992) by using computer technology to provide environment learning support in blended learning instruction. This model was aimed at developing the knowledge of professional nurses working in hospitals with the following five phases: 1) preparation and review of

existing knowledge; 2) implementation of the blended learning model; 3) study and revision; 4) inference through group processes; and 5) tests and evaluation. The development of the model in line with constructivism learning instruction will produce maximum benefits in improving the knowledge and abilities of professional nurses who serve as important role models for transferring nursing knowledge and skills to the nursing students of Boromarajonani College of Nursing, Suphanburi. The model can also be used to benefit improvement of anatomy and physiology knowledge for other groups of professional nurses. The quality development guidelines utilizing the PISIT model is a model capable of meeting the needs for enhancing the knowledge capabilities of professional nurses in regards to knowledge application in providing health services to service recipients in line with safety standards while keeping up with the time consistently with the constantly-changing health contexts of the modern age. The purposes of this study were: 1) to study basic information, opinions and needs for blended learning in anatomy and physiology study for professional nurses 2) to study the development of the blended learning model for anatomy and physiology for professional nurses 3) to propose an experiment for the use of the blended learning model for anatomy and physiology study for professional nurses 4) to assess and revise the blended learning model for anatomy and physiology study for professional nurses.

Approach and method:

In this study, the researcher applied research and development (R&D) rules and procedures and studied data systematically in order to construct the knowledge rehabilitation model for anatomy and physiology for professional nurses. The researcher applied blended research procedures by using qualitative research procedures in content analysis (Elo & Kyngäs, 2008), studying the situation surrounding the problem, studying the situation of the need for an anatomy and physiology knowledge rehabilitation model, and evaluating the model. Additionally, the researcher used quantitative research to confirm and test the aforementioned model with instruments to achieve the research objectives. The research was conducted according to the procedures shown in the research conceptual framework.

Population/Sample

The number of informants were specified and classified as follows:

1) A pilot study was used to specify the number of research participants. In general, the data collection criteria for medical and public health research were applied. The pilot study set the number of informants to 10-30 people (Isaac and Michael, 1995; Hill, 1998; Van Belle, 2002). In this study, 15 participants were specified in the pilot study.

2) In specifying the number of research participants in the qualitative study, the size of the sample representative of informants with data power was at least 10 people (Malterud et al., 2016); therefore, 15-20 people served as informants in the data collection for the qualitative study.

3) In specifying the number of research participants for model development, the sample size calculation formula of Frison & Procock (1992) and Singh & Micah (2014) was used in order to produce a sample size capable of predicting model development effects. The researcher obtained a sample size of 30 people and deemed it fitting to increase the sample size by an additional 20% to compensate for subjects who may be unable to participate in the research according to criteria. As a result, the number of subjects in this part of the study was 40 subjects obtained through purposive sampling.

The study was conducted in hospitals and homes;

1. During the study of the situations, problems and needs, data was collected from 20 hospital executives; and 15 professional nurses.
2. During the construction, implementation, development and evaluation of the learning instruction model, data was collected from

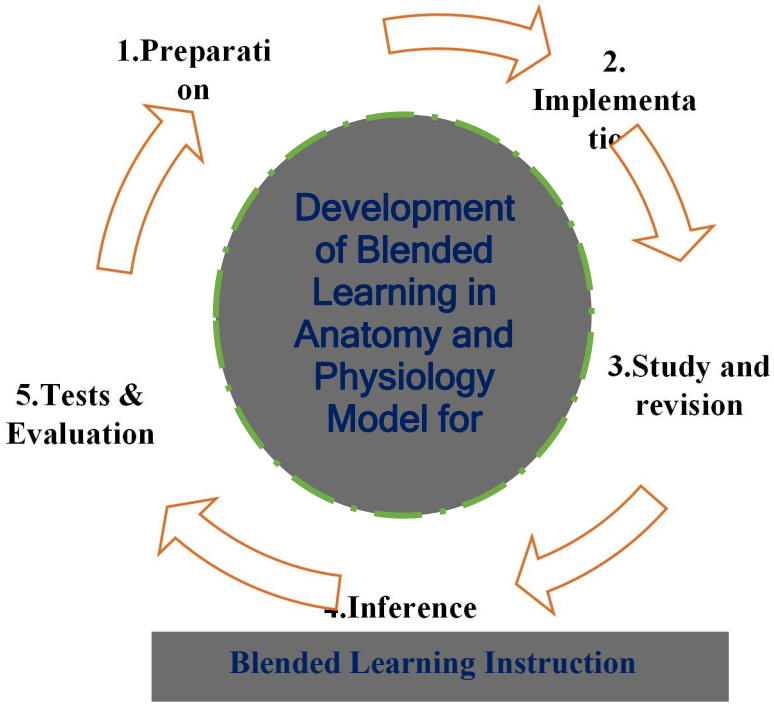
Set 1: 15 people (Pilot Group 1)
Set 2: 40 people (Participants)
Set 3: 15 people (Pilot Group 2)

Research Procedures

This research relied upon research and development rules and procedures (R&D). Overall, the development involved the following eight phases: 1) Research (R_1) – Analysis was conducted on the basic information about the problem and the analyzed basic information was used to construct the model; 2) Development (D_1) – It consisted of the design and development of the learning model ($PIE_{Anatomy}$ Model); 3) Implementation Research (R_2) – The $PIE_{Anatomy}$ Model model was implemented in Target Group 1 (Implementation: I) and the researcher explained research objectives to the sample

group consisting of 15 subjects; 4) Development (D_2): Design and Development (D and D) – Qualitative information was collected through focus group discussion with 15 research participants, and the model was submitted for qualified expert evaluation to determine the effectiveness of the model and evaluate consistency and appropriateness by using the logical model; 5) Implementation Research (R_3) – The PISIT model was implemented in 40 professional nurses who were preceptors of the practical training centers of Boromarajonani College of Nursing, Suphanburi, Thailand who were members of the studied target group (Implementation: I). The researcher explained the research objectives to the target group and used purposive selection to specify inclusion criteria according to set research procedures. The goal was to emphasize online blended learning instruction; 6) Development (D_3): Design and Development (D and D) of the PISIT Model – Qualitative data was collected through focus group discussion with 15 members of the target group who were professional nurses who participated in learning instruction (R_3). The purpose of the focus group discussion was to seek recommendations and guidelines for revising and improving the model appropriately. Afterwards, the researcher revised the model as appropriate. 7) Implementation Research (R_4) – The PISIT model was implemented (Implementation: I), and the researcher explained the research objective to the target group consisting of 15 professional nurses or the experimental group (Pilot Group 2); 8) Development (D_4): Design and Development (D and D) of the PISIT Model – Qualitative data was collected through focus group discussion with 15 members of the target group who participated in learning instruction (R_4) and who were willing to participate as qualitative informants with the aim of producing recommendations and guidelines for appropriately revising and improving the model. Afterwards, the researcher revised the model again as appropriate; that was the final phase of the development of the anatomy and physiology blended learning model for nursing science.

PISIT model



Picture 2 The "PISIT" Development of Blended Learning on Anatomy and Physiology Model for Nurses for Boromarajonani College of Nursing, Suphanburi

Instrumentation

The instrumentation used in this research consisted of a questionnaires developed based on the learning instruction/model development theory and is divided into two parts as follows: 1) qualitative instruments composed of qualitative data collection questions used to collect data from hospital nursing group executives and professional nurses; and 2) model evaluation form, learning instruction media quality evaluation form; pre-learning-instruction evaluation form; post-learning-instruction evaluation form; OSCE evaluation form; and PISIT model satisfaction evaluation form. Data collection was conducted from March 2020 to May 2020. Data were sorted according to informants in the following order:

1. During the study of the situation, problem and needs, qualitative data were collected from 1) 20 hospital executives; and 2) 15 professional nurses who were preceptors of practical training centers.

2. During the construction, implementation, development and evaluation of the learning instruction model, quantitative and qualitative data were collected from professional nurses who gave cooperation to participate in the research, divided into three sets as follows:

Set 1: 15 people (Pilot Group 1) – Quantitative data was collected by measuring knowledge before and after learning instruction/qualitative data was collected again from 15 people for evaluation of the model.

Set 2: 40 people (participants) – Quantitative data was collected by measuring knowledge before and after learning instruction. The OSCE evaluation form and satisfaction evaluation form were used/qualitative data was collected again from 15 people for evaluation of the model.

Set 3: 15 people (Pilot Group 2) – Quantitative data was collected by measuring knowledge before and after learning instruction. The OSCE evaluation form and satisfaction evaluation form were used/Qualitative data was collected again from 15 people for evaluation of the model.

Data Analysis

The researcher used methods to analyzed data divided into the following two categories:

a. Qualitative Data: Content analysis was conducted (Elo & Kynga¨,2008) following the principles for synthesis, analysis, thinking and interpretation.

b. Quantitative Data: Statistical analysis was conducted with description of individual factors by distribution of frequencies, percentages, mean values, standard deviations, measurement of knowledge scores through comparison of knowledge test scores before and after learning instruction, satisfaction levels, and paired sample t-test statistical analysis with reliability at 95% ($\alpha = 0.05$).

Ethical Considerations

The study followed the ethical principles of the Declaration of Helsinki (World Medical Association, 2013). All participants were informed about the study and assured that their participation was voluntary and that they could withdraw at any time. All participants gave their written informed consent and were guaranteed confidentiality and anonymity in the presentation of findings. The research was approved by Thailand's Ethical Review Committee for Research with Human Subjects from Boromarajonani College of Nursing, Suphanburi, Thailand.

Findings

For the findings of this research, the researcher would like to present two key issues consistent with the research objectives as follows:

1. Synthesis of basic information on the need for a blended learning model for anatomy and physiology for professional nurses

1.1 Findings on study into the problem and need for the development of an anatomy and physiology knowledge model based on two groups of informants with data collection by focus group interviews. Data obtained from interviews were transcribed verbatim, and data analysis was conducted using content analysis. The research findings are as follows:

1.1.1. On the findings from collecting qualitative data from 20 executives (nursing groups), the study found that informants (participants) perceived the issue or problem of lack of knowledge in anatomy and physiology in nurses, and nurses who worked for several years forgot their learning, and hardly any training was provided to review the aforementioned topics. As a result, the informants wanted nursing education institutions to develop a learning model to help provide nurses with robust anatomy and physiology knowledge and which that nurses can learn on their own conveniently at any place and time. Accordingly, instruction to provide knowledge in these subjects will help promote safety in nursing procedures performed in the care of patients receiving hospital treatment. In establishing topics and contents for instruction, they should be topics that professional nurses practice frequently in patient care procedures as described in the following statements:

> *"For nursing groups, we want nurses to receive rehabilitative training. That is because we understand its importance to quality and safety in nursing procedures…The learning content that should be reviewed, therefore, should be procedures that nurses have to perform on a regular basis, such as the insertion of NG tubes or Foley catheters, suction, midwifery, and stress evaluation…"*

> *"Professional nurses who work for a long time… gradually lose their anatomy and physiology knowledge according to their work years. We would like learning instruction to be provided in a way that allows nurses to learn on their own so that no travel time is wasted."*

1.1.2. On the findings from collecting qualitative data from 15 professional nurses who were preceptors of nursing students, the qualitative data analysis of nurses in this group produced consistent opinions with the above group, that is, there were issues with forgetting content, not receiving training in the aforementioned topics and not having time. Accordingly, the group wanted a way of instruction that is convenient and can be learned by nurses on their own wanted knowledge to be provided in topics essential to frequently performed nursing procedures such as anatomy and physiology related to different locations for intravenous injections, how to administer fluids intravenously, stitching

wounds, administering nasogastric feeding tubes, suctioning of bodily secretions in oroendotracheal tubes, insertions of urinary catheters, and birth mechanisms as described in the following statements:

"I forgot them… I couldn't remember everything. I want some rehabilitative training."

"I want to train in anatomy and physiology in topics related to the procedures that we have to perform frequently such as how to administer IV fluid, stitch wounds, insert NG, suctioning phlegm, inserting catheters, and so on."

"The problem is that I don't have time to train. Especially now with COVID-19, that's out of the question…That's because it's impossible to travel anywhere for many days. It would be great if an online format is provided, since we'd definitely be able to study it."

1.2 On findings from the synthesis of related concepts, theories and research, the study was conducted by using the systematic review format. From this phase of the study, the researcher used the knowledge obtained to develop instruments for quantitative and qualitative evaluations and create and develop the blended learning model for anatomy and physiology.

2. Development, implementation and revision of the blended learning model for anatomy and physiology for professional nurses.

The first model or the $PIE_{Anatomy}$ model was constructed based on the constructivism learning instruction concept (T.M. Duffy et al., 1992) and computer technology for environment learning support. The process consisted of the following three stages: 1) In the preparation stage, the content, teaching methods, learners, teachers, manuals and pre- and post-learning testing were prepared. 2) Implementation consisted of blended learning or learning by personal observation or watching of videos and face-to-face online learning. 3) Evaluation consisted of completing pre- and post-learning testing.

Afterwards, the researcher presented the learning model to five qualified experts for evaluation of the model's quality and three qualified experts evaluated the learning media content. Then the researcher synthesized the model by summarizing the important issues of each model component based on the opinions and recommendations of the qualified experts in order to connect the concepts and theories to be applied in solving problems and developing a complete learning model. The researcher applied the evaluation results given by the qualified experts to revise the model.

The researcher then implemented the model in Pilot Group 1, which consisted of 15 professional nurses. Thereafter, the researcher collected qualitative data. Data analysis findings showed that professional nurses in Pilot Group 1 wanted instructions to be provided such that learners can engage more with their instructors and that teaching should involve media such as equipment and prop models to accompany self-learning through videos. Additionally, it was found that the learning format should include a step to reflect learner ideas in line with the statement that

"It should be a good and modern learning format that is suitable to the situation. However, we would like learners to be more engaged with their instructors, with a step in which learners can reflect their knowledge and verify whether they were right or wrong."

Then the researcher revised and improved the model to produce the PISIT model. This model was presented to qualified experts for evaluation of the model, learning media, examination and OSCE measurement form before additional actual data collection. However, the qualified expert evaluation all results are shown in Tables 1.

Table 1 Showing Evaluation Results by Qualified Experts of the Learning Models with teaching Medias and Manuals

Evaluation	***Mean***	***S.D.***	**Experts-level agreement**
$PIE_{Anatomy}$ Model			
-Manual (n=5)	3.80	0.45	High
-Media (n=3)	3.67	0.57	High
-$PIE_{Anatomy}$ Model (n=5)	4.20	0.44	High

PISIT Model			
-Manual (n=5)	5.00	0.00	Highest
-Media (n=3)	4.67	0.57	Highest
-PISIT Model (n=5)	4.60	0.55	Highest
-Certified PISIT Model by experts (n=5)	5.00	0.00	Highest

Then the researcher revised the PISIT model according to expert recommendations, and the researcher implemented the revised model in professional nurses who were preceptors of practical training centers. In total, the target group in this study consisted of 40 subjects. The learning method consisted of the following: 1) The preparation step involved preparing learners, teachers, content and exams. 2) The implementation step involved blended learning whereby teachers used teaching methods that allowed students to learn on their own by using videos composed of three modules (9 hours), followed by online face-to-face learning. 3) In the study and revision step, teachers used objective structured clinical examination (OSCE) to review learner understanding. 4) The inference by group processes occurred face-to-face online. 5) Tests and evaluation consisted of evaluation of knowledge testing before and after learning instruction and OSCE test scores, and evaluation of satisfaction in learning with the PISIT model in 15 professional nurses.
In addition, based on the collection of quantitative data and analysis of quantitative data in regards to the satisfaction of professional nurses on the learning model, it was found that professional nurses had a high degree of satisfaction in the learning model, while qualitative data analysis found consistent results in line with the statements

> "*I like this learning model. It's good for today's world where we have to use technology. It's a learning model that's suitable for professional nurses like us, who struggle with time limitations. Because this occupation involves a lot of hard work, this learning model helps us review our knowledge on our own."*

Then the researcher applied the recommendations to make revisions and improvements.
The researcher tried the model in 15 professional nurses in Pilot Group 2. The researchers were showed the pre- and post-learning test results, the OSCE scores and satisfaction scores of professional nurses are via Participants group and Pilot Group2 as shown in Table 2-4.

Table 2 Showing Pre- and Post- Learning Evaluation Scores Using the Models

Knowledge	***Mean***	***S.D.***	***D***	***SD_d***	***T***	***df***	***p***
Pilot Group 1 (n=15): *PIE $_{Anatomy}$ Model (Implementation I for Development Model)*							
Post - test	22.93	5.76	5.03	2.51	2.97	14	<.010
Pre - test	17.87	3.25					
Participants (n=40): *PISIT Model (Implementation in participant group)*							
Post - test	27.07	4.10	7.37	0.28	7.66	39	<.001
Pre - test	19.70	3.82					
Pilot Group 2 (n=15): *PISIT Model (Implementation II for confirm model)*							
Post - test	29.47	4.03	9.20	2.02	6.47	14	<.001
Pre - test	20.27	2.01					

Table 3 Showing Knowledge Scores by Using OSCE

OSCE test score	**Level**					
	Low		**Middle**		**High**	
	n	*%*	*n*	*%*	*n*	*%*
PIE $_{Anatomy}$ Model - Pilot Group	*-No measurement -*					
PISIT Model						
- Participants	3	7.50	14	35.00	23	57.50
- Pilot Group 2	1	6.67	2	13.33	12	80.00

Table 4 Showing Evaluation Results of Satisfaction in the PISIT Learning Model

Satisfaction	Level					
	Low		Middle		High	
	n	*%*	*n*	*%*	*n*	*%*
PISIT Model						
- Participants	0	0.00	4	10.00	36	90.00
- Pilot Group 2	0	0.00	2	13.33	13	86.67

In collecting and analyzing qualitative data, it was found that professional nurses in Pilot Group 2 made recommendations for improving this learning model in other subject topics, such as described by the statement,

> *"This learning model is suitable for nursing groups, but it should be expanded upon to include other topics or subjects."*

Finally step, the researcher submitted the PISIT model to qualified experts for evaluation and validation of quality. Evaluation showed that the PISIT model is a model that completed research procedures and certified as a model capable of developing knowledge in anatomy and physiology for professional nurses.

Discussion of the Findings

Based on the evaluation results and validation of the model by qualified experts, the opinion was that the PISIT model was generally appropriate at the highest level, while the evaluation results on teaching media and manuals on the overall all suitability of the model was at the highest level. In addition, the knowledge about anatomy and physiology in professional nurses who were preceptors for nursing students working at hospitals was higher after participation in learning based on the PISIT model. The findings indicate that the aforementioned learning model was able to increase knowledge in professional nurses in all three groups, namely, Pilot Group 1, Participants, and Pilot Group 3.

The model was revised and improved prior to actual data collection, and retesting occurred in order to reevaluate the quality of the model (Pilot Group 3) before submission to qualified experts for certification. The research findings showed increased knowledge in professional nurses with correlations with satisfaction in the use of the PISIT learning model. The findings of this research are congruent with the findings of studies by Bloom (1976) and Boonkusol and Intawat (2017), which stated that providing learning activities and models that meet the expectations of learners will naturally result in learners enthusiastically participating in learning activities, leading to student confidence and fast learning, and that organizing models for activities promote successful learning instruction in Elaboration Theory (Huang , Ma, & Zhang, 2008). Thus, concerning the learners who participated in the blended learning model, this model is a type of learning instruction which utilizes technologies to facilitate appropriate learning in nurses, and it benefits learners because learners are able to plan and manage content appropriately and in an organized manner on their own. This type of learning instruction promotes learning achievements in learners and improves the knowledge transfer abilities of learners while being appropriate and consistent with the modern era (Allen & Seaman, 2005). Learners are able to learn at times convenient to them, so there are fewer limitations associated with traditional teaching models. The blended teaching and learning is the process of study streaming from multi learning strategies with considering with students, situation, content to response studying in different learners' characteristic. The blended teaching can manage the instruction both inside and outside classroom with using online technology to enhance learners to learn effectivelyand to achieve the learning objectives (Suphasri & Chinokul, 2015). However, the findings showed that the nurses professional were satisfied with the PISIT learning model which was due to the change in the learning system as well as being tasked with interesting and challenging online lessons. The findings of this research are congruent with the findings of studies by Banyen, Viriyavejakul & Ratanaolarn (2016), which stated that undergraduate students were satisfied with the blended learning model with interesting and challenging computerbased lessons outside classroom. Students understood the content better, enjoyed the self-directed learning and doing things independently.

Thus, as professional nurses possess knowledge and confidence in integrating anatomy and physiology knowledge in their practice, quality and safe patient nursing care will be provided. Accordingly, professional nurses in these groups can also transfer their own knowledge in the context of preceptors teaching nursing students training at hospitals, so the anatomy and physiology knowledge standards will also be created along with safe patient procedures for nursing students.

Conclusion

The professional nurses who participated in the learning model had higher knowledge levels post-learning with statistical significance at 0.05. This means that the PISIT learning model can increase knowledge in anatomy and physiology in professional nurses. In addition, the satisfaction levels of the PISIT learning model in research participants ranged from high to very high, thus indicating that the aforementioned modal is suitable for professional nurses, who want to use it to develop their anatomy and physiology knowledge.

Recommendations for Application of the Research Findings

1. In applying the model in learning instruction, especially in online classrooms, teachers should motivate students to participate in learning activities as much as possible.
2. For the learning instruction model, considerations should be made concerning appropriateness to subject content and consistency with student-centered learning.
3. For various learning instruction processes, teachers should be able to adjust flexibly with content and schedules.
4. Internet networks have to be sufficiently fast to facilitate online learning instruction, so the capabilities of internet networks have to support the ability to access large file sizes and timely responses to activities between teachers and learners without disruption.

Recommendations for Future Research

Studies should be conducted on the progress and retention of learning in blended learning instruction for anatomy and physiology study for professional nurses.

Conflict of interest and funding

The authors declare that there is no conflict of interest.

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