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A blended learning using contextual teaching learning: strengthening nursing students' procedural knowledge and interprofessional collaboration

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ABSTRACT

Introduction: The level of knowledge about the types of teaching instruction through blended learning in nursing education is still lacking. This study aims to develop blended learning using contextual learning and evaluate its effect on procedural knowledge and interprofessional collaboration.

Methods: A quasi-experimental study was conducted from January to March 2022. The total participants were 96 students from one of the nursing departments in Indonesia, who were equally divided into experimental and control groups. The experimental group received a blended learning method with a combination of contextual learning for 400 minutes for four meetings. Meanwhile, 48 students in the control group received traditional blended learning. Mann-Whitney U test to compare between treatment and control groups. The instrument used to measure the interprofessional education variable was the Nurse-Physician Collaboration Scale and procedural knowledge was measured through a test of 25 multiple choice questions about procedural knowledge.

Results: The implementation of blended learning based on contextual teaching significantly increased their procedural knowledge (pre M = 43.30 vs post M = 79.00), and interprofessional collaboration (pre M = 58.08 vs post M = 83.79) with p-value < 0.01.

Conclusions: Blended learning using contextual learning was effective for increasing procedural knowledge and interprofessional collaboration in nursing students. The application of this instruction is highly recommended for nursing departments in higher education institutions as an effort to achieve qualified health workers for sustainable development and well-being.

Keywords: blended learning, contextual teaching-learning, interprofessional collaboration, procedural knowledge

Introduction

The Covid-19 pandemic has created lessons for nursing education to develop a flexible learning process for students, which can substitute online learning for face-to-face learning in class. During Covid-19, face-to-face learning in class is limited to reduce the risk of transmission, so blended learning is needed (Rohendi *et al.*, 2020)

Smartphones have recently received tremendous attention for use in learning and they are evidently convenient and effective for educators and students in the nursing education field (Langford *et al.*, 2015, Liao *et al.*, 2015, Curran and Standage, 2017, Willemse *et al.*, 2019, Plotzky *et al.*, 2021). Existing scholarship has demonstrated that the use of smartphones benefits improving the learning process, especially during the Covid-19 pandemic (Banskota *et al.*, 2020, Huckins *et al.*,



2020, Olum *et al.*, 2020, Yu *et al.*, 2021). Accordingly, researchers, particularly in nursing education, are actively developing new learning methods which are more effective and utilize technology, such as smartphones, in a contextual way: like the real context in clinical services (hospitals or other health centers) (Barbosa *et al.*, 2021, Ngenzi *et al.*, 2021). In line with developments in the use of information technology in learning, as well as dealing with learning problems during the Covid-19 case and in anticipating similar cases in the future, blended learning is needed (Rohendi *et al.*, 2020). The aim of this research is to develop an effective learning method for nursing students, as an effort to improve the professionalism of nurses through increasing knowledge and skills. This effort is more critical, especially in difficult times, such as during the Covid-19 situation.

Nowadays, one of the learning problems in Indonesia's nursing education is the low level of procedural knowledge of nursing students and interprofessional collaboration skills (Uliyah *et al.*, 2020). A recent study showed that collaboration between nurses and doctors at one hospital was poor (66.8%), and most of them were still at the negotiation level (Uliyah *et al.*, 2019). This is reinforced in previous research which illustrates that the nurse-doctor relationship has not been collegially established. The hierarchical interaction pattern between nurses and doctors is still visible in terms of disciplines (Arya *et al.*, 2010, Setiawan, 2013, Sinubu *et al.*, 2021). This collaboration problem is not only experienced by nurses in Indonesia but also in other countries. Two examples come from Turkey and China. Existing research finds that collaboration between nurses in Turkey is still minimal in terms of problem-solving, coordination, professionalism, and cooperation (Durmuş *et al.*, 2018), while, in China, the level of collaboration is lacking in terms of effective communication, perceived respect, and willingness to collaborate (Wang *et al.*, 2018).

Learning processes and methods in nursing education that do not apply collaborative and contextual learning principles by utilizing information technology can result in students not properly understanding collaboration skills and knowledge procedures when practicing in hospitals. The stronger this is evident when students come to practice in hospitals, it shows that interprofessional collaboration from nurses has not been so grounded. One way to develop it is through collaborative learning called "interprofessional education"; this approach can improve interprofessional competence, increase student roles and responsibilities, and increase student

confidence and skills (Wagner *et al.*, 2011, Cunningham *et al.*, 2018). Smartphones are considered to provide enormous benefits in the field of nursing education, namely the ease of accessing e-learning. The use of e-learning technology makes learning more interesting and flexible so that the efficiency and effectiveness of learning are assessed (Zhampeissova *et al.*, 2020, Franco *et al.*, 2021). Face-to-face learning is also able to deepen their nursing skills; however, the digital era requires nursing students to master their knowledge and skills comprehensively from both sources: e-learning and face-to-face learning (O'Connor and Andrews, 2018). This shows how blended learning is very important to be applied in the field of nursing education.

Research shows that mixed learning instruction in nursing education is effective in enhancing new learning experiences (McCutcheon *et al.*, 2015, Jowsey *et al.*, 2020, Leidl *et al.*, 2020). However, the types of instruction that are useful for addressing the problems of procedural knowledge and interprofessional collaboration skills have not been revealed. A learning model that is appropriate for the learning objectives in each topic determines learning outcomes, including the achievement of procedural knowledge abilities and interprofessional collaboration. The models that currently exist are only blended learning, and contextual learning independently, not integrated, but with a combined model between blended learning and contextual learning. Each model will cover the other's weaknesses. Constructivism theory states that learning is building knowledge through real experience in the field, meaning students will easily understand and know what they are learning when their knowledge is based on real conditions that exist in the field. Elaborating on this theory, students will easily understand aspects of procedural knowledge interprofessional care and collaboration if they learn and knows directly the context of care services in clinics and hospitals.

Therefore, this study aims to develop mixed instructional instruction using a contextual teaching approach and examine its effect on students' interprofessional collaboration and procedural knowledge. The basic nursing course was chosen because this topic involves basic nursing skills and interprofessional cooperation in the health sector.

Materials and Methods

Research design and samples

A quasi-experimental design with pre-post was used in this study. Participants were separated into control and experimental groups and the same lecturer taught

both groups to eliminate bias factors. The lecturer in charge had 10 years of teaching experience with a focus on basic nursing research. Lecturers are responsible for organizing teaching content and implementing current experiments. To ensure the accuracy of the current experiment, the participants were not aware of the existence of the experimental and control groups. The experimental group with blended learning used contextual teaching learning and the control group only used blended learning. The research sample was selected using simple random sampling, with the inclusion criteria being that students were enrolled in an active semester and were taking basic nursing courses in the nursing study program at Muhammadiyah University, Surabaya.

Intervention

Before the learning activities, students were given 100 minutes of basic nursing lessons. Students took part in learning using a blended learning system, with four meetings, each meeting held for 100 minutes. The first meeting conducted offline learning (face-to-face in class using contextual learning methods) while the second was held for 100 minutes online using an e-learning system with contextual learning methods. The third meeting was conducted offline (face-to-face) with the contextual learning method and the fourth was conducted online using e-learning with contextual learning methods. All groups were pretested for 15 minutes to determine the level of procedural knowledge at the beginning of learning. At the end of instruction, a post-test was conducted on the level of procedural knowledge and measured interprofessional collaboration skills in both the experimental and control groups.

The control group involved students who received blended learning, but not with a contextual approach and comprised 48 students who were members of class B in the nursing study program, Muhammadiyah University, Surabaya. To minimize bias, strict grouping was not recommended nor was it recommended to discuss the material taught in the two groups, as well as performing statistical tests on other factors that might influence the results on procedural knowledge and interprofessional collaboration variables.

The two groups received the same material, but different learning methods. The topic discussed was fluid and electrolyte needs in basic nursing courses. Explanation of the topics was given at each meeting. The first meeting was the topic of systems that play a role in fluid and electrolyte needs, how body fluids move, human body fluid needs, regulation of body fluid

volume. The second meeting was on the topic of types of fluids, problems with fluid needs, electrolyte needs, electrolyte regulation, types of electrolyte fluids, problems/disorders with electrolyte needs, acid-base balance, types of acid-base, acid-base balance problems, and all factors that influence fluid and electrolyte needs. The third meeting was the topic of nursing action procedures to fulfill fluid and electrolyte needs, the practice of measuring blood pressure, the practice of measuring pulse, the practice of rumple lead test, practice of giving oral fluids, the practice of collecting urine for examination material, the practice of collecting urine from patients using catheters, and the practice of inserting a catheter condom. The fourth meeting was on the topic of the practice of giving oral fluids, the practice of administering fluids intravenously, the practice of caring for IV wounds, and the practice of changing IV fluids. The selection of material for learning trials is related to the interprofessional collaboration variable because this material entailed many nursing procedures that require collaboration and nursing problems in this material are almost always experienced by patients admitted to hospital.

Participants

The participants were first year students who received basic nursing courses at the Bachelor of Nursing Program in one of the universities in Indonesia and who had never studied basic nursing before. As many as 96 participants were recruited and randomly assigned to either the experimental group ($n = 48$) or the control group ($n = 48$).

Measures

Procedural Knowledge

Procedural knowledge was measured by a test of 25 multiple choice questions about procedural knowledge, which consisted of three indicators; knowledge of techniques/procedures for meeting basic nursing needs, knowledge of skills related to basic human needs, and knowledge of when to use nursing procedures. Internal consistency of procedural knowledge (Cronbach's alpha 0.86 for the pre-test measure and 0.85 for the post-test measure).

Interprofessional Collaboration

The interprofessional collaboration questionnaire was adapted from two sources. The first was the collaboration measurement scale of doctors and nurses entitled *Nurse-Physician Collaboration Scale*. The scale measured three components: joint participation in the

Table 1 Participants' characteristics (n = 96).

Variable	Group		Test of group differences*
	Blended Learning Using Contextual Teaching Learning (experiment group) n=48	Blended Learning (control group) n=48	
	(n,% or sd)	(n,% or sd)	
Gender			p=0.402
Male	16 (33.3)	20 (41.7)	
Female	32 (66.7)	28 (58.3)	
Age (mean, SD)	19.17 (+0.964)	19.10 (0.660)	p=0.652

*Mann-Whitney U Test

treatment/care decision-making process, sharing of information, and collaboration (Ushiro, 2009, Hossny and Sabra, 2021). The second was a scale for managing collaboration between nurses called the Nurse-Nurse Collaboration Scale (NNCS). This scale measured collaboration in various ways, conflict management, common goals, communication and coordination, professionalism and autonomy (Liao *et al.*, 2015). Thus, the questionnaire of interprofessional collaboration used in this study consisted of five indicators: joint participation, information sharing, cooperation, scope of practice and common goals. Furthermore, a 5-point Likert scale was used ranging from 1 (strongly disagree) to 5 (strongly agree). Internal consistency of interprofessional collaboration was confirmed with Cronbach's alpha of 0.79 for the pre-test measure and 0.83 for the post-test measure.

Data Analysis

The first data analysis used was descriptive statistics. Pearson correlation was also carried out to examine the relationship between the study variables. The Kolmogorov–Smirnov test was performed to verify the normality of the data and showed that they were not normal. Hence, the Mann-Whitney test was performed to analyze possible differences between groups before the intervention. The second data analysis was the main analysis and was conducted to investigate the effect of the intervention in two ways. First, to verify intra-group differences between pre-test and post-test data collection, the Wilcoxon test was performed on each group. Furthermore, a new Mann–Whitney test was performed to analyze the in-group differences between the two groups after the intervention. SPSS 24.0 program software was used to process the data.

Table 2 Differences between Groups before the Intervention

	Control Groups (n = 48) M (SD)	Experimental Groups (n = 48) M (SD)	Z*	p
Procedural Knowledge	41.20 (15.95)	43.30 (15.27)	-0.746	.455
Interprofessional Collaboration	57.41 (6.68)	58.08 (7.15)	-0.554	.580

*-z table < z count < + z table (no difference), z table=1.96

Ethical Consideration

This research received the Ethical Clearance Certificate No. 003570920 from Universitas Muhammadiyah Surabaya. This study has obtained signed consent from participants with informed consent. Participants were given information about the objectives, benefits, advantages, methods, and procedures to be carried out while being research respondents. In addition, participation was voluntary and posed no physical or mental harm. Researchers gave participants the freedom to leave if they wished and assured and the information provided would be kept confidential.

Results

Table 1 shows descriptive statistics. In the two groups, the largest gender was female, for the group that received the blended learning intervention using contextual teaching learning it was 66.7%, and for the control group it was 58.3% based on different tests there was no difference between the groups. There was also no significant difference in age between the two groups; the age of the experimental group was 19.17 years and the control group was 19.10 years.

There was no difference before the intervention of the two study groups, as shown in Table 2. This can be seen in the calculated Z value for the two variables and the two groups have the same calculated Z value between + Z table (1.96). This shows that there was no difference before the intervention, as well as the test results. P > 0.05 for the two variables.

As shown in Table 3, significant differences were found between the groups before the intervention. There was no difference after intervention in the control group for the two variables; this can be seen with a value

Table 3 Comparison of Effects of Intervention

		Control Groups (n = 48)			Experimental Groups (n = 48)		
		M (SD)	Z	p	M (SD)	Z	p
Procedural Knowledge	Pre	41.20 (15.95)	-0.225	.822	43.30 (15.27)	-5.941	.001
	Post	41.37 (18.87)			79.00 (16.55)		
Interprofessional Collaboration	Pre	57.41 (6.68)	-0.203	.839	58.08 (7.15)	-6.033	.001
	Post	57.60 (9.46)			83.79 (6.60)		

of $p=0.822$ for the variable procedural knowledge, and $p=0.839$ for the variable interprofessional collaboration, but there was a difference in the experimental group with a value of $p=0.001$. The experimental group showed higher scores than the control group in the procedural knowledge and interprofessional collaboration variables.

Table 4 shows the effect of the intervention. In the experimental group, a significant difference was found between before and after the intervention of blended learning with contextual teaching learning on nursing students' procedural knowledge and interprofessional collaboration. This is shown in the p value = 0.001 for the two variables. In two variables, the score after the intervention was higher than before intervention.

Discussions

This study examines the effect of blended learning instruction using contextual teaching learning on nursing students' procedural knowledge and interprofessional collaboration. It was found that the nursing students experienced higher increase of procedural knowledge in blended learning instruction using contextual teaching learning than the traditional/general blended learning. This finding shows that blended learning with contextual teaching learning can be an avenue to build or construct nursing students' existing knowledge, such as knowledge on how to do nursing care, practice nursing care, and so forth (Pereira *et al.*, 2014, Rohendi *et al.*, 2020, Rohmah *et al.*, 2023).

In the study, there were no differences between the two groups before the intervention, but after the intervention there were differences between the two groups in two variables, namely procedural knowledge and interprofessional collaboration. In the procedural knowledge variable, there was an increase in skills in indicators of observational, therapeutic, educational and collaborative care activities, including assessment of skills at the primary intervention and supportive

intervention levels. In the interprofessional education variable, there was also an increase in rates of 1) collaborative participation, e.g. exchange of opinions to solve patient/care problems; 2) exchange of information, e.g. exchange of ideas for further patient care and opinions and suggestions from doctors; 3) collaboration, e.g. mutual support with professional tasks and qualifications, sharing of tasks with representatives of other professional groups; 4) fulfillment of tasks according to the area of activity, e.g. knowledge of the patient's health status; and 5) joint achievement of goals, such as patient-centered guidance and negotiation of treatment goals.

This finding extends the existing related studies which only inform that blended learning instruction in the nursing education field gives nursing students new experiences in learning: such as the learning becoming more flexible fun, and appropriate for the students (McCutcheon *et al.*, 2015, Jowsey *et al.*, 2020, Leidl *et al.*, 2020).

Procedural knowledge is defined as the ability to understand a series of steps that will be carried out properly and correctly (Evi-Colombo *et al.*, 2023); the knowledge of someone on how to do something. This knowledge is not only exerted verbally but also in behaviors such as acting and practicing the skills. Procedural knowledge is also associated with understanding, flexibility, and critical judgment. Individuals with low procedural knowledge can only use standard techniques, which may lead to a low ability to produce efficient solutions and possibly the inability to solve new questions. However, more flexible problem solvers (individuals) with deep procedural knowledge, who use techniques other than those that are usually practiced will find the best matching solution for different conditions and purposes. In terms of knowledge, it is also recognized that conceptual knowledge has a strong impact on procedural knowledge (Braithwaite and Sprague, 2021).

Table 4 Differences between Groups after the Intervention

	Control Groups (n = 48) M (SD)	Experimental Groups (n = 48) M (SD)	Z	p
Procedural Knowledge	41.37 (18.87)	79.00 (16.55)	-7.080	.001
Interprofessional Collaboration	57.60 (09.46)	83.79 (06.60)	-8.187	.001

The possible reason for the increase in the students' procedural knowledge is that blended learning using contextual teaching learning provides space and learning stimuli in the aspect of constructing knowledge by synergizing the existing context to strengthen the existing procedural knowledge of the students. This finding are similar with a recent study which found that blended learning based on contextual teaching-learning that uses appropriate approaches, strategies and methods for thinking needs to gain procedural knowledge is possible to occur considering the learning activities in both face-to-face and online are conducted with the same principles (Uliyah *et al.*, 2019, Uliyah *et al.*, 2020).

Activities in blended learning using contextual teaching-learning that have been prepared through lesson plans, teaching materials/books, as well as existing e-learning, with time flexibility can be the sources of building students' strong knowledge. It is because they can be done repeatedly to achieve learning competencies. Accordingly, the students can improve their thinking skills to gain new knowledge, ultimately procedural knowledge. This is in line with the notions that procedural thinking patterns are trained through the features available in e-learning so as to familiarize students with procedural thinking, including the content of nursing case study material whose completion is trained to follow the steps in solving nursing problems (Uliyah *et al.*, 2019, Chen, 2021). Moreover, feedback from students during the implementation of blended learning using contextual teaching learning may facilitate the students' increased nursing students' procedural knowledge.

Regarding interprofessional collaboration skills, the results indicate the effect of increasing collaboration interprofessional abilities of nursing students who experienced blended learning instruction with contextual teaching-learning. This result extends the existing previous scholarship, which again simply informs that blended learning instruction in the nursing education field gives nursing students new experiences in learning: such as the learning becoming more flexible, fun, and appropriate for the students (McCutcheon *et al.*, 2015, Jowsey *et al.*, 2020, Leidl *et al.*, 2020). Our result shows evidence that blended learning based on contextual teaching learning with existing learning characteristics meets the principles of increasing interprofessional collaboration. Interprofessional collaboration is defined as a form of cooperative relationship, open communication to share, and decision-making processes with the aim of maximizing the fulfillment of healthcare needs. It is also defined as

a positive partnership between a team of healthcare professionals through a participatory, multi-disciplinary collaborative and coordinated approach to joint decision-making around health issues (Orchard *et al.*, 2005, Dahri *et al.*, 2021). This collaboration is formed from nine elements, including cooperation, assertiveness, responsibility, communication, autonomy, coordination, common goals, mutual respect and trust (San Martín-Rodríguez *et al.*, 2005, Dahri *et al.*, 2021).

Nursing students' interprofessional collaboration skills can be trained and grown during the students' professional lives in nursing education through blended learning instruction with contextual teaching-learning. This model has an influence on growing and training students' interprofessional collaboration skills. It can be seen from various learning activities which involve an element of collaborative learning. For example, various case study task activities in the context of nursing/clinical services are carried out in small groups. This can foster students' motivation, cooperation, responsibility, and mutual learning in each member of the group. It can also foster students' positive attitudes. as well as facilitate students' practice of mutual respect for diversity and understanding of individual differences. Collaborative learning activities with the completion of case studies conducted in groups with different backgrounds both in terms of culture, level of knowledge, gender, and personality, means that students learn from collaboration, which in turn increase students' interprofessional collaboration skills (Uliyah *et al.*, 2019, Uliyah *et al.*, 2020).

The existence of collaborative learning elements in blended learning instruction using contextual teaching learning can train the attitudes and basics of collaboration skills. It can also affect students' learning outcomes considering collaborative learning highlights more on specific tasks and sharing tasks in group work, comparing between groups and group procedures, and providing flexibility to students in groups (Apriyono, 2013). In addition, students giving feedback to one another may also be able to provide space for students to build awareness, positive attitude, responsibility, and cooperation which are the basis of interprofessional collaboration. Through case study discussions, interprofessional collaboration is also possible to happen because students learn from each other and exchange ideas, which can build collaborations. Blended learning instruction using contextual teaching-learning will provide opportunities to build interprofessional collaboration skills in the future.

Conclusion

It was found that the nursing students experienced a higher increase in procedural knowledge and interprofessional collaboration in blended learning instruction using contextual teaching learning than traditional/general blended learning. This finding shows that blended learning with contextual teaching learning can be an avenue to build nursing students' procedural knowledge and interprofessional collaboration. These findings are novel and extend the existing previous scholarship which merely informs us that blended learning instruction in the nursing education field gives nursing students new experiences in learning: such as the learning becoming more flexible, fun, and appropriate for the students.

This study has successfully addressed the gap of knowledge as mentioned in the introduction; however, in many respects, this study still has limitations. First, the blended-learning instruction using contextual teaching learning was implemented in one course in a short period of time, not a whole semester. Subsequent studies extending the time to one full semester and applying to other courses in nursing departments are welcomed. Second, the confounding variables may explain the effect of the instructions on students' procedural knowledge and interprofessional collaboration such as learning environment and the duration of intervention. Further research may examine these confounding variables.

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