Meta-Analysis of Flipped Learning Effects in Nursing Education

Subjects: Nursing

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This is a meta-analysis of the effect of the outcome variables of fragment learning in nursing education, such as clinical strength, critical thinking ability, self dominance and learning satisfaction.

clinical competence   self-directedness   critical thinking   satisfaction   meta-analysis

1. Introduction

Recently, flipped learning education has been applied to increase the efficiency of education and learning processes due to rapid changes in the educational environment and to convert students into active learners [1][2].

Flipped learning is a learner-centered teaching method in which learners self-learn online before class, asking questions to the instructor and discussing the content with peers during class [3]. This provides a dynamic mutual learning environment for professors and allows students to focus creatively on their learning needs without time and space constraints [4]. In flipped learning, students manage the learning process through learning content before class, so students' self-discipline and self-regulation can be improved [5]. Additionally, during this class, students can participate in various active learning activities, such as question-and-answer, discussion, group activities, problem-solving, and receiving immediate feedback [6]. A positive change in academic achievement levels has been observed in medical education with an increasing interest in flipped learning classes and reducing boredom [7].

The first study that applied flip learning in the field of nursing education was published in 2013 [8]. A flipped learning model has been applied in nursing education to reinforce nursing competence according to changes in the clinical environment. It is difficult to acquire sufficient knowledge within limited class hours and clinical practice with the existing teaching methods. This is due to the lack of both direct nursing experience in observation-oriented practice and a connection between the theory and clinical practice. Upon employment in a hospital, a gap is noticed in performing practical tasks in clinical nursing [9]. Thus, nursing educators applied flipped learning to improve the quality of education and prepare for complex nursing practice [1][6]. Flipped learning applied to nursing education has a large amount of learning and professional content, and students are inevitably passive in class. It helps students find lecture materials on their own, perform prior learning, and conduct self-directed learning through active learning in class [10]. It analyzes and integrates learning content and is applied to solve complex clinical situations by improving critical thinking skills [11][12]. Additionally, the learner's perception of flipped learning also shows a positive response, and because they can watch the videos whenever they want, a high level of

satisfaction with video lectures during pre-classes is observed [13]. A change in the teaching method of instructors was urged while emphasizing the importance of insight, situational awareness, critical thinking ability, and clinical reasoning to promote learning in nursing students [14].

Various studies have recently been conducted to identify the effectiveness of flipped learning in nursing education. Prior studies have influenced self-directed learning and learner satisfaction [11]. Critical thinking tendencies have significantly increased compared to conventional teaching methods [10]. Additionally, improved academic achievement [15], learning satisfaction, self-efficacy, knowledge, and communication ability [16] indicated positive effects. However, contradictory research results also exist. In clinical practice education, the experimental group that experienced flipped learning improved in clinical performance [11], as compared to the control group that received lecture-type instruction. While some studies outlined no significant results [17], others reported improved critical thinking tendencies [18]. There are limitations in understanding the effectiveness of flipped learning results, including studies in which thinking tendencies are not significant [19]. When the consistency of these individual research results is insufficient, a meta-analysis can be used to identify factors. Regarding the systematic review and meta-analysis of flipped learning applied to nursing education, two foreign studies have focused on the effects of theoretical knowledge and skill scores [20]. In Korea, no meta-analysis has been reported that systematically and quantitatively evaluated the results of flipped learning education. A meta-analysis was conducted because different educational systems and cultural differences in different countries can affect the effectiveness of flipped learning education [21].

Particularly, clinical competence, critical thinking ability, and self-directedness [12], which are the purpose of flipped learning and are important in nursing education, are contributing to the effect of flipped learning education. The application of the flipped learning technique to clinical practice has a positive effect on learning satisfaction [16][22]. Therefore, the purpose of this study was to confirm the effect size on clinical competence, critical thinking ability, self-directedness, and learning satisfaction. Based on these results, this study provides a scientific basis for evaluating the necessity and validity of flipped learning. It is a basis for educational systems and researchers with diverse cultural backgrounds, evaluating the effectiveness of flipped learning models as a teaching–learning method in nursing.

2. Meta analysis of reading effect in nursing teaching

This entry will systematically study the effects of clinical power, critical thinking ability, self-dominance and learning satisfaction applied to nursing education, and conduct meta-analysis to put forward its effect with a comprehensive and objective method. Therefore, the main results are as follows.

The 18 selected studies took fleas as as the intervention group and traditional instructional learning as the control group. Two of them (11.1%) were studied before and after the randomized controlled design, and the RCT design was used overseas. 16 (88.9%) were the pre event and post event design of Da Zhao Qun who used NRCT design, 6 overseas and 10 at home.

In the methodological quality evaluation of papers, considering Rob's high or uncertain projects, 7 papers (38%) with selective bias were not randomly arranged. Part 2 (12.5%) did not propose a specific method to generate random allocation order, and Part 3 (16.6%) did not hide the allocation order. Therefore, researchers can predict the intervention group. In addition, in the case of biased results, 14 papers (77.7%) did not propose specific methods to blind research participants and researchers. Because the instructor's intervention is needed in flip learning, the distinction between participants and researchers is limited, which will affect the results of meta-analysis. In flip learning, despite the limitations of RCT research methods, a variety of methods need to be explored in order to verify the quality of learning methods.

Regarding the subject types that applied flipped learning, practical subjects were the highest, with nine studies (50%), followed by seven theoretical subjects (38.9%) and two theory and practical subjects (11.1%). The theoretical subjects were critical thinking, nursing process, pathophysiology, health assessment, and patient safety, and the practical subjects were simulation practice, basic nursing practice, and clinical nursing practice.

Among the analysis papers, when applying flipped learning in practical subjects, nursing techniques cannot be directly performed. Thus, the methods and procedures of nursing techniques are repeatedly learned through audio-visual data [11]. Video content was used [19] or developed and applied by the instructor [23]. As the learning experience provided by the medium is different, the instructors set a clear goal through flipped learning, and the curiosity and motivation of learners were met.

As a result of the meta-analysis of flipped learning studies applied to 18 studies, the overall average effect size was 0.68, corresponding to the median effect size. This is similar to the study showing the median effect size of 0.58 as the overall average effect size of the learning effects of domestic flipped learning [24] and the study showing a median effect size of 0.59 as the effect size of flipped learning on domestic college students [25]. It was confirmed that flipped learning was more effective than traditional lecture-style classes when applied to nursing education.

As a result of comparing the effect sizes of the flipped learning outcome variables in this study, they were found in this order of critical thinking ability, learning satisfaction, clinical competence, and self-direction.

The critical thinking ability had a Hedges' g of 0.87, showing a large effect size and a high level of heterogeneity. In five studies, the experimental group to which flipped learning was applied showed improved critical thinking ability compared to the control group. It can be predicted that flipped learning, which allows students to ask questions and solve problems on their own through prior learning and to improve critical thinking skills through discussion with other students during class in the classroom [26], is effective in nursing education. Additionally, a previous study [19] showed that although it is possible to acquire knowledge and skills, there is a limit to critical thinking. Instructors must grasp the learner's disposition, attitude, and learning strategy and find and search for information rather than memorize knowledge; based on this, it is necessary to develop a running program.

As a result of analyzing the effect of flipped learning on learning satisfaction, the intermediate effect size was found to be Hedges' g = 0.79. When learning flipped learning, information was provided to students, such as videos,

animations, and images of clinical cases, inducing interest and resulting in positive responses. Satisfaction was high, as this allowed flexibility to learn at a desired speed and time [27][28]. However, there have also been studies with low learning satisfaction due to tasks assigned from prior learning during flipped learning, online environmental problems for learning, and adaptation to new teaching methods [8]. The instructor should consider the learner's learning environment when developing flipped learning activities. It is necessary to consider avoiding a learning gap, such as understanding the infrastructure for watching videos and prior learning, and it is necessary to analyze the learning conditions in detail per the learning goal. In other words, it is necessary to promote understanding of learning by providing students with a plan for the learning content and learning method of flipped learning in advance so that they can familiarize themselves with the content to be learned. Additionally, the learner's learning process was constantly monitored. A strategy for linking the content of prior learning and offline activities is needed by providing feedback on prior learning in the classroom.

As a result of analyzing whether flipped learning is more effective than traditional methods in improving nursing students' clinical nursing skills, the effect size of clinical competence had a Hedges' g of 0.53, showing a medium-sized effect. This confirmed that learning the procedure and techniques through videos was effective [29], and it was also confirmed by another study [30] that the clinical performance was improved by flipped learning in clinical practice. Nursing is a practical study. Direct nursing skills and repetitive practice are required to acquire and improve such skills. However, it is difficult to obtain qualitative improvement because of the inability to perform direct skills during flipped learning. When flipped learning is applied in practical classes, nursing skills and nursing theories are learned based on evidence, and in classroom sessions, the contents of prior learning can be directly performed. Additionally, it effectively improves students' nursing skills through immediate feedback from instructors [31]. Factors for achieving clinical performance include interpersonal relationships and communication, nursing process, critical thinking, nursing intervention, creative thinking, basic nursing, and problem-solving ability [32]. These are improved by applying flipped learning to the subject in the corresponding domain, helping them to effectively perform the clinical nursing skills corresponding to the detailed elements.

In this study, the effect size of self-directedness was small (Hedges' g = 0.37). The most important aspect of flipped learning is to increase the degree of self-directedness, and in many research results, self-directedness was improved through flipped learning [33][34]. Learners watched video lectures on pre-learning to familiarize themselves with the learning content, and the activities in the classroom were focused on learners. Notably, the self-directedness is improved due to the increased sense of responsibility and activeness in all learning processes [35]. Self-directedness is an important variable affecting learning outcomes, such as learning motivation, academic achievement, and satisfaction [36]. Through flipped learning, the instructors foster the learner's learning ability and act as facilitators such that learners can have flexibility and develop lifelong learning habits for self-directedness [37]. Accordingly, when the learner's characteristics and teaching methods are matched, self-directedness is achieved successfully. When designing a flipped learning curriculum, it is necessary to develop educational methods to improve self-directedness ability by focusing on learner-centered education.

Other variables related to the subject type and pre-learning method were the modulating variables that explained the difference in effect size. As a result of meta-ANOVA using the subject type as the moderator variable, the

following were practical subjects, theory and practice mixed design subjects, and theory subjects.These results showed a significant difference in the flipped learning effect according to the subject type (Q = 13.59, $p \leq 0.001$), and it was confirmed that the effect of a flipped learning class was higher in practical subjects. In a practical subject, flipped learning helps one experience knowledge integrated with observation and experience [12]. The interaction between the instructor and students increases, and the nursing skills gradually improve [8]. Studies have confirmed this effect. Additionally, the effect size value was calculated by classifying the learning methods into video method (15 episodes) and the method where video and lecture books were given (five episodes) simultaneously, indicating that the learning by the video method was higher but not statistically significant (Q = 1.22, p = 0.269). This could be because when the video and lecture book were given simultaneously, the number of assignments to be learned increased, consequently increasing the learning burden, and the lack of time and grade were not reflected. It is necessary for the instructor to explain in advance how the pre-learning videos are related to the lecture contents in order for the students to plan an appropriate amount of pre-study.

It was difficult to measure various variables because there were differences in the specific research methods such as the flip learning education method applied to each study, the number of applications, and the time. In future research, it is necessary to improve the quality of research by describing specific research methods for teaching and learning designs applied to flipped learning classes, such as the characteristics of instructors and learners and the learning process.

Critical thinking, clinical reasoning, and clinical performance are required for nursing students to adapt to the rapidly changing nursing environment [14]. Applying flipped learning to equip self-directedness ability, students learn how to acquire abilities and competencies by applying various information rather than simply accumulating knowledge and facing problems in a medical nursing environment.

The limitations of this study are as follows. An extensive search on flipped learning was performed using flipped learning keywords and a series of other relevant keywords. However, the possibility of publication bias cannot be excluded because the publication languages are limited to English and Korean.

This study selected RCT and NRCT research among the studies related to flipped learning applied to nursing education to increase the reliability of the research results. The academic significance included confirming the magnitude of the effect on clinical Competence, critical thinking ability, self-directedness, and learning satisfaction as outcome variables, an effect that was determined to exist.

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