RESEARCH ARTICLE

The effect of metacognition and self-directed learning readiness on learning performance of nursing students in online practice classes during the COVID-19 pandemic period

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Abstract

Aim: This study was a descriptive correlation investigation to determine the effects of metacognition and self-directed learning readiness on learning performance of nursing students in online practice classes during the COVID-19 pandemic.

Design and Methods: In this descriptive cross-sectional study, 135 subjects were randomly selected from junior students of one university in South Korea.

Results: In this study, metacognitive knowledge in nursing students showed a positive relationship with subjective learning performance ($r = 0.34$, $p = 0.002$) and objective learning performance ($r = 0.38$, $p = 0.016$). Metacognitive control in nursing students also showed a positive relationship with subjective learning performance ($r = 0.37$, $p = 0.001$) and objective learning performance ($r = 0.41$, $p < 0.001$). Self-directed learning readiness in nursing students showed a positive relationship with subjective learning performance ($r = 0.38$, $p = 0.011$) and objective learning performance ($r = 0.40$, $p < 0.001$).

Conclusion: For effective online practical education, nursing students' internal characteristics of metacognition and self-directed learning should be identified in advance, and schools should strive to help nursing students' learning performance by developing and applying education systems or contents.

KEYWORDS
learning performance, metacognition, nursing students, online practice classes, self-directed learning readiness

1 | INTRODUCTION

The COVID-19 pandemic, which has spread around the world since 2020, has produced many changes in our society. To prevent the spread of this infectious disease, governments in each country have implemented high-intensity social distancing policies to limit the operation of facilities and industries where many people gather.

As a result, non-face-to-face contact has been adopted throughout society, and the long-term prevalence of the COVID-19 epidemic is making this non-face-to-face contact a common way for people to communicate (Cohen et al., 2020; Kang, 2020). A society where non-face-to-face contact is generalized is also referred to as an 'untact society', reflecting the phenomenon of reduced face-to-face contact and increased online contact. This non-face-to-face transition,

or transition to an untact society, has also led to many changes in the nursing educational field, especially the practicum. In response to the government's high-intensity social distancing, the Ministry of Education in Korea decided to convert university classes to full or partial non-face-to-face classes depending on the nature of the department's classes (Lee & Lee, 2020).

The curriculum of nursing colleges accounts for a high proportion of clinical practice on and off campus, but with the paradigm change in education due to COVID-19, many contents of practical nursing education are being provided by converting to online practice types (Kang, 2020). However, the dramatic change in the educational paradigm triggered by COVID-19 may not have allowed for sufficient preparation for the online practice education transition by students and professors who did not expect this situation, and its effects should be continuously examined (Khalil et al., 2020; Park et al., 2020). To establish successful online practice classes in nursing education and to present new types of practice education, it is necessary to describe the performance of online practice education and identify the internal factors of students.

Learners' metacognition is an important factor in leading overall cognitive activities in the problem-solving process and is necessary for the self-motivation and initiative of learners on the Web, where the learners themselves share opinions online and build and execute new knowledge. Metacognition is the ability of learners to identify and control or regulate their cognitive knowledge on their own, including subfactors such as beliefs and attitudes about problem-solving processes and personal feelings such as anxiety or convictions during cognitive tasks. Learners consciously reflect on and analyse their problem-solving processes to determine the causes of success and failure associated with problem-solving, which allows them to effectively apply previous problem-solving methods in new situations. Metacognition is an important factor of problem-solving abilities that can affect a student's learning performance. Furthermore, online practice education in nursing can be inferred to require learners' metacognition as comprehensive performance learning in which learners' knowledge and skills are put together, similar to clinical practice education (Chen et al., 2019; Medina et al., 2017).

Today, it is important for learners to increase their ability to prepare for self-directed learning because online classes have become essential due to COVID-19, and the style of education has rapidly changed to a learner-centred one (Noh & Kim, 2019; Zhu & Jing Liu, 2020). Learners may feel a psychological burden and anxiety because learners and professors are separated due to the nature of online learning, while smart devices optimized for learners allow them to explore the information they need and to control their speed. Thus, learners' academic performance in online learning is critically influenced by their self-directedness. In online learning, learners' academic performance can be inferred to be heavily influenced by internal factors related to self-regulation, but there is a lack of research confirming this in nursing (Moteri, 2019; Qalehsari et al., 2017).

In this study, metacognition and self-directed learning readiness were identified as factors that affect nursing students' learning performance through online practice education of nursing college students to derive implications for the internalization and improvement of online practice education in the future. This study aimed to provide basic data on the paradigm shift in high-quality nursing education due to COVID-19.

1.1 | Study objectives

The purpose of this study was to explain the impact of metacognition and self-directed learning readiness on nursing students' learning performance. The specific objectives were as follows: (1) to identify metacognition, self-directed learning readiness and learning performance in participants; (2) to identify the relationships between metacognition, self-directed learning readiness and learning performance in participants; and (3) to identify the effect of metacognition and self-directed learning readiness on learning performance in participants.

2 | MATERIALS AND METHODS

2.1 | Study design and sampling

A descriptive cross-sectional study was conducted using a simple random sampling technique with random number generator software on 135 nursing students during their online practice classes from March to June 2020.

2.2 | Study participants

The participants in this study were third-grade junior nursing students in a clinical practicum for adult health nursing at a university in South Korea. The subjects of this study watched nursing videos provided in online practice training and imitated them by self-video, attended online conferences, analysed and discussed adult nursing problems, watched nursing activities videos provided in adult wards and participated in discussions.

2.3 | Sample size

An appropriate sample size for multiple regression analyses with more than one independent variable must be at least 50 to maintain a statistical power of 0.8 or higher. However, the sample size of 50 is only the minimum size, and in most research situations, there are many conservative views that the sample size must be more than 100 to be stable. In this study, our total sample size was 135, excluding insufficient questionnaires.

2.4 | Measurements

2.4.1 | Metacognition

The Junior Metacognition Awareness Inventory (MAI) was used to measure the participants' metacognition. The Jr. MAI was modified from the MAI by Shin and Choi (2005), which was first developed by Schraw and Dennison (1994). It comprises 30 items in a self-report questionnaire that are classified into two domains of cognitive knowledge (15 items) and cognitive regulation (15 items) on a five-point Likert scale (1=not at all and 5=extremely). In the tool, a higher total sum score indicates a higher degree of metacognition. The reliability of this tool has been previously demonstrated by a Cronbach's alpha coefficient ranging from 0.88 to 0.92, and this study showed a Cronbach's alpha of 0.92 (Jin & Ji, 2021; Muflih et al., 2020).

2.4.2 | Self-directed learning readiness

The Self-Directed Learning Readiness Scale (SDLRS) is a self-report questionnaire with Likert-type items developed by Dr. Lucy M. Guglielmino in 1977. This study used the Korean translated version of Guglielmino's (1977) SDLRS to measure the degree of self-directed learning readiness. It comprises 58 items on a five-point Likert scale (1=not at all and 5=extremely). In the tool, a higher total sum score indicates a higher degree of self-directed learning readiness. The reliability of this tool has been previously demonstrated by a Cronbach's alpha coefficient ranging from 0.84 to 0.94, and this study showed a Cronbach's alpha of 0.91 (Cho & Kim, 2021; Kim & Yang, 2020).

2.4.3 | Learning performance

In this study, learning performance was measured by classifying subjective learning performance and objective performance. To measure subjective, this study used the cognitive, affective and psychomotor (CAP) perceived learning scale developed by Rovai et al. (2009). The CAP perceived learning scale comprises nine items rated on a five-point Likert scale (1=not at all and 5=extremely). In the tool, a higher total sum score indicates a higher degree of learning performance. The reliability of this tool has been previously demonstrated by a Cronbach's alpha coefficient ranging from 0.79 to 0.88 (Anthonysamy, 2021), and this study showed a Cronbach's alpha of 0.86. In addition, to measure objective learning performance, this study used a written test with 10 questions regarding nursing practice, each worth 10 points. We analysed the level of difficulty and discrimination to determine the validity of the written test questions. The results showed that the average difficulty of the 10 questions in the written test was 55%, and the difficulty level of all the questions was more than 30% each. In terms of discrimination levels, the mean was 0.33, and the discrimination of all the questions was 0.20 or higher each.

2.5 | Data collection

The data on the metacognition and self-directed learning readiness of the participants were collected before the online class, and learning achievement was collected after the online class through online platforms. The survey took an average of 15–20min per person, and once the survey was completed, the questionnaire was immediately processed and stored. The participants were informed that questionnaires with completed data analysis were encrypted and stored on the researcher's computer and were not used for other purposes.

2.6 | Statistical analysis

The data were analysed using SPSS statistical software (version 25.0; SPSS Inc). The specific analysis procedures were as follows: (1) metacognition, self-directed learning readiness and learning performance were analysed using descriptive statistics; (2) a Pearson's correlation analysis was performed to analyse the relationships among metacognition, self-directed learning readiness and learning performance; p-values less than 0.05 were considered statistically significant; (3) the enter method of multiple regression was used to test the effect of metacognition and self-directed learning readiness on learning performance. All statistical results were considered statistically significant at $p < 0.05$.

2.7 | Data collection and ethical considerations

The Department Research Committee of a university approved this research process, and the administrative authorities of each participating institution reviewed and approved the study. Consent to participate was implied by the voluntary completion and return of the questionnaire.

3 | RESULTS

3.1 | Demographic characteristics of participants

The differences in learning performance by general characteristics are reported in Table 1. There were more females (102, 75.56%) than males (33, 24.44%). Participants in this study were relatively more religious (94, 69.63%), and about 80.0% had graduated from a high school with a regular curriculum. Most of the participants (98, 72.59%) lived in the city where the university was located. Of the total participants, 56.3% ($n=76$) had experienced distance education, and the majority responded that they had good Internet accessibility (102, 75.56%). There were no significant differences in subjective and objective learning performance according to the general characteristics.

TABLE 1 Differences in learning performance by general characteristics ($N = 135$).

Characteristics	Categories	n (%)	Subjective LP Mean±SD	Objective LP Mean±SD
Gender	Male	33(24.44)	34.24± 5.21	69.24± 6.64
	Female	102(75.56)	33.22± 3.68	71.89± 8.45
Religion	Yes	94(69.63)	31.65± 3.56	70.23± 8.69
	No	41(30.37)	30.81± 2.22	71.44± 7.59
Education	High school graduated	108(80.00)	32.19± 2.37	71.84± 7.30
	Passed Qualification Examination for high school degree	27(20.00)	29.34± 1.68	69.22± 9.06
Place of residence	The city where the university was located	98(72.59)	31.58± 2.82	73.24± 9.36
	A city where the university was not located	37(43.41)	30.24± 4.56	71.39± 8.54
Experience in distance education	Yes	76(56.30)	31.23± 3.13	71.62± 8.47
	No	59(43.70)	28.29± 2.31	69.34± 8.57
Internet accessibility	Good	102(75.56)	32.64± 3.79	72.16± 8.99
	Fair	29(21.48)	29.34± 1.58	69.34± 6.93
	Poor	4(2.96)	24.04± 3.03	67.23± 8.67

Abbreviation: LP, learning performance.

TABLE 2 Correlation among study variables ($N = 135$).

Variables	Subjective LP r (p)	Objective LP r (p)
Metacognition		
Metacognitive knowledge	0.34(0.002)	0.38(0.016)
Metacognitive control	0.37(0.001)	0.41(<0.001)
Self-directed learning readiness	0.38(0.011)	0.40(<0.001)

Abbreviation: LP, learning performance.

3.2 | Relationships metacognition, self-directed learning readiness and learning performance

The relationships among metacognition, self-directed learning readiness and learning performance are shown in Table 2. Metacognitive knowledge, which is a subcategory of metacognition, was positively correlated with subjective ($r = 0.34$, $p = 0.002$) and objective learning ($r = 0.38$, $p = 0.016$). Metacognitive control, which is a subcategory of metacognition, was also positively correlated with subjective ($r = 0.37$, $p = 0.001$) and objective learning ($r = 0.41$, $p < 0.001$). Self-directed learning readiness was positively correlated with subjective ($r = 0.38$, $p = 0.011$) and objective learning ($r = 0.40$, $p < 0.001$).

3.3 | Effect of metacognition and self-directed learning readiness on learning performance

The factors affecting learning performance are presented in Table 3. In order to find out the variables affecting each learning performance, discontinuous variables such as gender, religion, educational, place of residence, experience in distance education

and internet accessibility area were converted into Dummy variables and analysed by the Enter method for multiple regression analysis. In this study, the factor affecting learning performance in participants was self-directed learning readiness, which showed 49% explanatory power. The factors affecting objective learning performance in participants were both metacognitive control and self-directed learning readiness; between them, metacognitive control had a greater impact ($p < 0.001$). The model showed an explanatory power of 50%.

4 | DISCUSSION

The COVID-19 pandemic has prompted a digital transformation across social, cultural, political, economic and educational fields and the advent of new terms, such as 'The New Normal' and 'Untact' (Chiodini, 2020; Mukhtar et al., 2020; Qazi et al., 2020). In particular, in the field of education, remote education has emerged as a new norm in traditional education and is converging with or, at least, becoming an alternative curriculum. As practical education in nursing, which was traditionally conducted in hospitals or community sites, has been switched online due to COVID-19, there have been concerns about the decline in student satisfaction and the quality of practical education (Kaup et al., 2020). As a result, it is necessary to determine the factors that affect the learning performance of nursing students who receive online practical classes.

Metacognition is a reflection of cognition whereby learners establish and evaluate goals and plans to solve problems based on an understanding of their own cognitive processes: They must develop an ability to know what they know and do not know and what results from their actions (Jin & Ji, 2021) (Medina et al., 2017). To improve metacognition, learners need to reflect on and evaluate their overall performance in the learning process. Through clinical practice

TABLE 3 Factors affecting learning performance ($N = 135$).

Predictors	Subjective LP				Objective LP			
	β	t	p	95%CI	β	t	p	95%CI
Metacognitive control					0.45	4.21	<0.001	−0.134 to −0.033
Self-directed learning readiness	0.77	12.23	<0.001	0.064–0.821	0.36	0.3.68	0.005	−1.421 to −0.179
R^2	0.52				0.51			
Adjusted R^2	0.49				0.50			
F(p)	49.33 (0.014)				55.43 (0.003)			

Abbreviations: 95% CI, 95% confidence interval; LP, learning performance.

education, students can experience various clinical judgement processes to identify and solve various complex problems that arise in actual nursing patients (Chen et al., 2019). Online practice mainly provides patients' nursing problems in the form of videos or scenarios, and, after learning the topics, students are evaluated on the Web for their clinical nursing decisions to solve the nursing problems (Chiodini, 2020; Kaup et al., 2020). In this study, the objective learning performance of third-year students who had just started adult nursing practice was influenced by metacognition and self-directed learning readiness. Online education must be completed in a Web environment where no one can intervene without control of the personal space; therefore, the students themselves must steadily review their time management or understanding of classes (Mahdy, 2020). As a result, online learning requires more students' own reflection courses to solve problems in their educational field, and the students must actively communicate with the people around them about the contents and results of online classes. To improve objective learning performance, such as test scores of nursing students as a result of online practical education, it is necessary to organize and provide learner-centred practical online content, so that students can actively and continuously check their learning attitude and preparation.

Online education has shifted from a professor-centred educational environment to a learner-centred environment. Moreover, it is consumer-oriented education. In such an educational environment, self-directed learning preparation involves learners taking the initiative in learning themselves, diagnosing their learning needs, setting learning goals, securing human and physical resources, selecting and implementing appropriate learning strategies and evaluating their achievements (Dewart et al., 2020; Jowsey et al., 2020; Moteri, 2019). Subjective learning performance is an individual's desire to achieve educational goals, and, in this study, self-directed learning readiness influenced subjective learning performance. Accordingly, an important issue for online practice nursing education is how learners develop and enhance self-directed learning readiness to make their own learning plans, implement them and evaluate their own learning results (Kim & Yang, 2020). The university and staff should reorganize the educational, human and physical systems to improve nursing students' self-directed learning readiness and help learners prepare sufficiently to solve practical tasks assigned in online practice. These efforts will have a positive impact

on learning performance by helping nursing students transform into self-directed learners during the COVID-19 pandemic situation and consequently improve their satisfaction with learning.

Effective online practical education for nursing college students should be supported by the conversion of curriculum and improvement of the learning environment. Above all, this is only possible through a shift to a user-centred awareness of the educational field. The nursing education challenges posed during the COVID-19 pandemic must be addressed through sustainable nursing educational innovation (Kachra & Brown, 2020). Therefore, it is meaningful to reconsider the role of education in international change surrounding education at this point and, especially, to analyse the experience of online practical education during the COVID-19 pandemic to identify future directions of nursing education innovation. An important part of the transition from classroom learning to online learning is the consideration of people. How students and professors' capabilities harmonize with the development of technology is important, and the institutional basis for implementing them should follow.

4.1 | Limitations and recommendations

As this study was conducted at a single time point on nursing students, it is necessary to compare and analyse each variable before and after online practice classes. In addition, as it was aimed at third-year students conducting adult nursing practice for the first time, it would be necessary to check what different aspects of online practice are shown for fourth-year students who already have clinical practice experience. Finally, research is needed to confirm students' learning performance by developing online practical education content that can faithfully reflect nursing students' metacognition and self-directed learning readiness and improve nursing problem-solving skills.

4.2 | Clinical implications

For the effective online practice learning of nursing students, students' internal abilities and characteristics should be considered to provide meaningful basic materials for developing various contents that can improve them.

5 | CONCLUSIONS

This study identified metacognition and self-directed learning readiness as factors affecting the learning performance of nursing college students in online practice education during the COVID-19 pandemic. The results of this study showed that metacognition and self-directed learning readiness were important in enhancing the learning performance of nursing students in online practical education. Therefore, for effective online practical education, nursing students' internal characteristics of metacognition and self-directed learning should be identified in advance, and schools should strive to help nursing students' learning performance by developing and applying education systems or contents.

AUTHOR CONTRIBUTIONS

Sanghee Kim contributed to the conceptualization, data curation, writing and editing of this study.

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CONFLICT OF INTEREST STATEMENT

The author has no conflicts of interest to disclose.

DATA AVAILABILITY STATEMENT

Research data are not shared.

ETHICAL APPROVAL

This study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Institutional Review Board of the university in South Korea where the study was conducted (Reference no. S-2020BK367-OW). Informed consent was obtained from all participants involved in the study.

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