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Evaluation System and Indicators for Determining the Quality of Extracurricular Programs in Nursing School[1)]

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< ABSTRACT >

The purpose of this study was to develop an evaluation system and indicators for extracurricular programs in nursing schools. To achieve this goal, first, the evaluation system of the extra-curricular program of nursing school was established according to the four-level of the Kirkpatrick model. In addition, components of Jeffries' simulation theory, commonly used in nursing education, were utilized to construct metrics for measuring learning performance and supplemented the indicators with the comments from the content expert interviews. A Delphi survey was conducted with seven experts to review the evaluation model and indicators developed based on the theoretical framework, and the final evaluation model was developed based on their feedback. After excluding indicators that did not meet the content validity criteria, a total of 35 indicators were developed in eight areas, focusing on four learning stages (learn, experience, advance, and perform). This study extends the existing theory by combining the Kirkpatrick model with Jeffries' teaching theory in the context of extra-curricular education and has practical significance by providing criteria information for deriving the outcomes of educational programs. Therefore, it provides a plan for the effective management of university extra-curricular education.

Key Words : Extracurricular program evaluation, extracurricular programs in nursing school, Kirkpatrick, Simulation Theory

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간호대 비교과 프로그램 질 관리를 위한 평가 체계 구축 및 지표 개발[1)]

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< 요 약 >

본 연구는 간호대학 비교과 프로그램의 평가체계 및 평가지표 개발을 목적으로 한다. 연구목적 달성을 위해 먼저 문헌고찰을 바탕으로 Kirkpatrick 모형의 4수준 모델에 따라 간호대학 비교과 프로그램의 평가체계를 수립하였다. 다음으로 간호교육 분야에서 사용되고 있는 Jeffries 시뮬레이션 이론의 구성요소를 활용하여 세부 학습수행에 대한 준거 지표를 구성하였고 내용전문가 인터뷰 의견을 바탕으로 지표를 보완하였다. 이론적 틀에 따라 개발된 비교과 프로그램 평가모형 및 세부 지표에 대해 7명의 전문가에게 델파이 조사를 실시하여 전문가 검토 의견을 토대로 최종 평가모형을 개발하였다. 내용타당도 기준값을 충족하지 못한 지표를 제외하고 4개의 학습단계(학습, 경험, 심화, 수행)를 중심으로 8개 영역에서 총 35개의 지표가 개발되었다. 이 연구는 비교과 교육 맥락에서 Kirkpatrick 모형과 Jeffries의 교수 이론을 결합하여 이론적 확장을 시도하였다는 데 의의가 있다. 또한, 교육 프로그램의 성과 도출을 위한 준거 정보를 제시하여 대학 비교과 프로그램의 효과적 운영을 위한 방안을 제공하였다는 데 실무적 의의가 있다.

주요어 : 비교과 프로그램 평가, 간호대학 비교과 프로그램, Kirkpatrick 모형, 시뮬레이션 이론

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Ⅰ. Introduction

Higher education institutions have been encouraged to develop and deliver an educational curriculum that integrates the demands of the industrial environment with the professional educational content in order to produce human resources for industrial change and to support the long-term development of a market economy (Sady et al., 2019; Salvioni et al., 2017). The need for competencies in education has emerged due to the gap between what students learn in school and what they need to know in the workplace (Grealish, 2006). Competency development aims to improve problem-solving skills, which required by different disciplines vary as much as the diversity of industries and work environments (Ten Cate & Scheele, 2007), but the competencies required by different disciplines vary as much as the diversity of industries and work environments in that the goal of competency development is to improve real-world problem-solving skills. In particular, narrowing the gap between theory and practice in the field of nursing is a major task in nursing education (Benner, 2012). Most new nurses have theoretical knowledge, but their capacity to apply transferable skills in practice, such as problem-solving, leadership, communication, and critical thinking, are limited (Mtshali, 2005).

Efforts have been made to provide learning experiences to develop nursing students' competencies and to validate their effectiveness. A number of studies have been conducted to measure competency outcomes after competency-based education, including studies to verify whether nursing students' competency levels improved before and after clinical practice (e.g., Hsu & Hsieh, 2013), and studies to demonstrate student performance through comparisons between groups using traditional and competency-based teaching methods (e.g., Hsu et al., 2016; Nadery et al., 2012; Wu et al., 2014). Alternatively, there have been pedagogical attempts to stimulate students' critical thinking and improve their clinical application skills by integrating new teaching strategies into the curriculum in lab courses covering specific educational topics such as anatomy or physiology (Kawashima & Petrini, 2004; Magnussen et al., 2000; Wagner, 2014).

Despite the importance of diverse learning practices to help nursing students integrate knowledge learned in school into practice and later adapt to clinical settings, there has been a lack of attention to instruction that is intentionally designed to provide learning experiences. In the knowledge-based economy, it was important to simply memorize facts and procedures, but in a rapidly changing society, high-level knowledge construction skills are required. In particular, soft skills such as analytical thinking, active learning, complex problem solving, critical thinking, creativity, and leadership are being emphasized as core competencies for professionals in the future (World Economic Forum, 2020).

Universities have recently reorganized their curricula and extracurricular activities based on core competencies (Kim et al., 2017; Shamsudin et al., 2014). An educational institution is responsible for analyzing the outcomes of the educational programs it offers based on the institution's educational objectives. One way to analyze the effectiveness of education is to examine whether the education system satisfies the academic strategy of the institution and to ascertain what activities are being carried out (Haslinda & Mahyuddin, 2009). Because evaluation is linked to the entire process of analysis, design, development, and implementation of a program (Schön, 1983), performance analysis requires that educational objectives, learning strategies, performance activities, and evaluation be organized in a way that is relevant.

Simulation learning strategies are increasingly being adopted in nursing education to offer high-quality learning opportunities, which facilitate the acquisition and enhancement of clinical competencies among nursing students. Jeffries (2005) guided the design and implementation of simulations used for teaching strategies and proposed a framework with empirical support for evaluating outcomes. With the widespread utilization of simulation theory, the effects of simulation learning and outcomes on student performance continue to be studied. Measurable effects found to date include skill performance, learner satisfaction, knowledge, critical thinking and clinical reasoning, confidence, and self-efficacy (O'Donnell et al., 2014). Although the Kirkpatrick evaluation system has been proposed as a valuable framework for classifying the outcomes of the simulation learning, previous studies that utilized this framework mainly focused on the analysis at levels 1 and 2. Only a few studies have systematically classified the results according to learning stages. Another limitation of existing research is that it analyzed a mix of individual and organizational effectiveness, which limits its ability to provide targeted recommendations for improving training programs.

In order for simulation-based training programs to be recognized as an effective new training method, they need to demonstrate their usefulness in producing improved outcomes

(Rutherford-Hemming et al., 2016). It is meaningful to systematically review the learning goals and outcomes when undertaking educational design using simulation frameworks, which are being encouraged in various contexts. Based on the lack of performance evaluation of educational programs that incorporate simulation theory in nursing education, this study aims to develop evaluation indicators for nursing school extra-curricular programs that incorporate Jeffries' theory and Kirkpatrick's evaluation model. To accomplish the research purpose, the learning objectives, learning styles, and assessment methods of a nursing school extra-curricular program will be established in accordance with the new Kirkpatrick learning levels. Next, using components of Jeffries' simulation theory, we develop detailed performance indicators for each of Kirkpatrick's learning stages into evaluation metrics for the extra-curricular program. In particular, by dividing performance indicators into learning and operational dimensions, we establish a feedback loop for program quality management which obtain information to improve learners' learning, and to feed improvements back into the training program.

II. Theoretical background

1. Application of the simulation strategy to extracurricular nursing programs

In the case of the Department of Nursing, unlike with other majors, the main learning objective is to help students adapt to the clinical environment, such as clinical practice or community health education. Educational practices and outcome measurement should be designed to reflect the distinct characteristics of each major. Simulation is emerging as a novel teaching strategy that provides students with opportunities to practice decision-making and problem-solving in a safe environment and to prepare them for real-life clinical settings (Jeffries et al., 2015). Docherty et al. (2018) reviewed engagement indicators, including higher-order learning, reflective and integrated learning, collaborative learning, student-faculty interactions, and supportive learning environment, to plan and deliver educational opportunities that encourage student-led engagement. Using the suggested engagement indicators as a simulation design factor, a simulation-based problem-solving educational program was designed for 4 major topics in nursing education (ethics, clinical practice, law, and research).

In general, the nursing competencies presented by the Korean College of Nursing include the ability: to apply general education, nursing expertise, and skills in an integrated way to provide holistic nursing care; to recognize legal and ethical responsibilities in the development of the nursing profession; to facilitate critical thinking; to conduct research that assists the scientific development of nursing practice; to demonstrate leadership skills to achieve nursing goals; to respond to changes in global healthcare policies; and to engage in communication and collaboration among different specialties to improve patient health. This suggests that design elements for simulation can be utilized in problem-solving educational activities and applied to extracurricular programs that provide learning experiences through problem-solving activities.

2. Evaluation of outcomes of educational programs in nursing schools

At the individual level, learning outcomes focus on competency building through educational programs, or for changes in an individual's knowledge, skills, and attitudes. Tan et al. (2018) conducted a meta-analysis of outcome-based education (OBE), which is practiced in nursing education, and summarized the factors that are used to evaluate OBE's effectiveness in cultivating knowledge, skill, attitude, satisfaction, and higher-order thinking. Knowledge was evaluated as a post-test score on the paper-based assessment of theoretical knowledge (Fan et al., 2015; Nadery et al., 2012; Wu et al., 2014), and skills performance was assessed through tests of procedural knowledge (e.g., basic nursing skills, specialized surgery, etc.) in a clinical setting and an evaluation of practical skills (e.g., communication, leadership, problem-solving skills, etc.) (Wu et al., 2014). The behavioral evaluation was performed through observational reports of the nursing students' behavioral skills while performing clinical procedures. In addition, the learning satisfaction of the participants and metacognitive abilities, such as critical inquiry, reasoning, and problem-solving judgment, were evaluated as outcome measures. In a study that measured the attitude change from the learner's perspective after participating in an intensive care unit internship, the evaluation indicators included academic/professional interest, confidence in clinical practice, and interest in treatment-related topics (Nascimento et al., 2008).

At the institutional level, the evaluation was conducted in a way that confirms the results of the individual outcomes. One study that evaluated the effectiveness of a program related to extracurricular sports activities assessed perceptions of educational quality (e.g., instructor, equipment, activity, communication, service personnel), value, satisfaction, and future intentions (e.g., loyalty, response capacity) (Pérez-Ordás et al., 2019). Another study of extracurricular programs in the science of learning by engineering students evaluated an increase in the attendance rate and grade point average (GPA), program satisfaction, major retention rate, and learning approaches (in-depth or superficial approach) (Van Hoof et al., 2020).

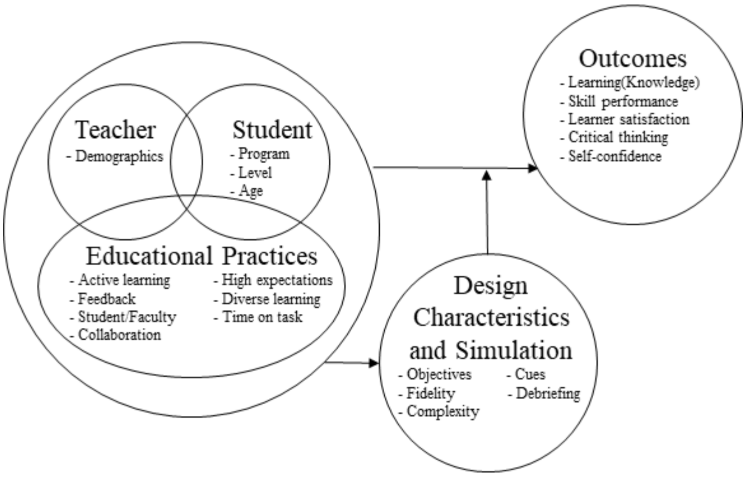
3. Theoretical framework of evaluation system

1) Instructional design: Jeffries Simulation Theory

Simulation is an effective learning method that complements and integrates the existing nursing curricula while addressing the increasingly complex health care needs of future generations of nurses (Campbell & Daley, 2013; Jeffries, 2005). From a socioecological perspective, the simulation framework is concerned with what behavioral results are derived when an individual's experience is substituted into a social situation (Campbell & Daley, 2013) and is regarded as a teaching theory based on learner-centered education and eclectic approaches, principles, and techniques from a theoretical perspective, including constructivism and sociocultural perspectives (Jeffries et al., 2015).

The Jeffries Simulation Theory includes six components: context, background, design, simulation experience facilitator, educational strategy, and educational outcomes (Jeffries et al., 2015). Context describes the situation and purpose of the simulation and determines the design and evaluation of the simulation. The background provides information on the curricular context or perspective in which the simulation experience will be implemented. The design is the building block for creating an instructional activity and includes learning objectives, plans, activities with appropriate content, complex problem solving, and fidelity (i.e., the degree of realistic implementation), roles of participants or observers, arrangement of activities, complexity, and briefing/debriefing strategy.

Simulations are experiential, interactive, cooperative, and learner-centered constructs, and the quality of the experience is determined by its degree of resemblance to reality. In the course of the simulation experience, an interaction between the instructor and learner occurs, and the instructor can utilize various teaching strategies (time limits, hints, etc.) and feedback to facilitate learning by the participants. The outcome of the simulation is manifested as learners' reactions and changes in learning and behavior (Jeffries et al., 2015) (see [Figure 1]).



〔Figure 1〕 Simulation Model

Source: Jeffries (2005), p. 97.

2) Outcome evaluation: Kirkpatrick 4-level model

The Kirkpatrick model provides a framework for classifying evaluation criteria to assess education and training (Praslova, 2010) and is used as a general evaluation framework in simulations (Aebersold, 2018). The Kirkpatrick model includes four levels of evaluation. When evaluating a nursing educational program, the first level of criteria is the reaction, which comprises the participants' reactions to the educational program (e.g., satisfaction, motivation, happiness) and influences the value assigned to learning and the learners' desire to participate in future programs. The second level of criteria—learning—gauges knowledge (understanding of concepts, principles, and contents), skill improvement, and attitude change. Level 3, pertaining to behavior, measures whether the learned skills are performed in an actual working environment, and level 4 is dedicated to measuring results by evaluating the impact of educational programs on patient safety, such as reducing infection rates (Boulet et al., 2011).

In a meta-analysis of the effectiveness of nursing educational programs using simulations, most of the studies that were included measured changes in satisfaction, confidence, and skill performance after simulation (e.g., Kim & Kim, 2015; Liaw et al., 2012; Shinnick et al., 2012; Zieber & Sedgewick, 2018). The measured outcomes were classified using levels 1 and 2 of the Kirkpatrick model (Haddeland et al., 2018). Although it is impossible to artificially omit certain steps when applying the Kirkpatrick model in the evaluation of educational effectiveness (Kirkpatrick & Kirkpatrick, 2006), previous studies have emphasized levels 1 and 2 but have omitted or lacked construct validity for levels 3 and 4, possibly because it is difficult to evaluate practical applied behavior and to measure the transfer effect of learning at levels 3 and 4. For the simulation to be accepted as a novel educational method, it is necessary to demonstrate the evaluation-based feedback system and its usefulness (Rutherford-Hemming et al., 2016).

As an alternative to the existing model, the New World Kirkpatrick model attempts to reduce confusion over the level of classification by suggesting essential elements to identify in levels 3 and 4. Thus, level 3 includes critical behavior, the requisite drivers, and on-the-job learning to the extent that learners apply what they have learned in their work, whereas level 4 focuses on the degree to which the targeted outcome occurs as a result of the learning and reinforcement implemented at level 3. The targeted result is regarded as a combination of the purpose and mission that the institution (organization) seeks to achieve (Kirkpatrick & Kirkpatrick, 2015).

In this study, the educational objectives and outcomes of levels 3 and 4 were clarified in accordance with the content that was elucidated by the New World Kirkpatrick Model. In level 3, to realize the level of action that was applied in the field, a real-life problem is presented in the classroom, and learning is structured around deriving a solution to that problem. Level 4 seeks to cultivate practical adaptability and core competencies that are necessary for solving problems in the clinical field, which is the ultimate goal of extracurricular education. Therefore, the focus is on discovering problems and presenting specific solutions in the real world rather than in the classroom. Furthermore, problem-based learning (PBL) and project-based learning (PjBL) are detailed strategies for achieving the learning objectives.

4. Composition of detailed evaluation indicators

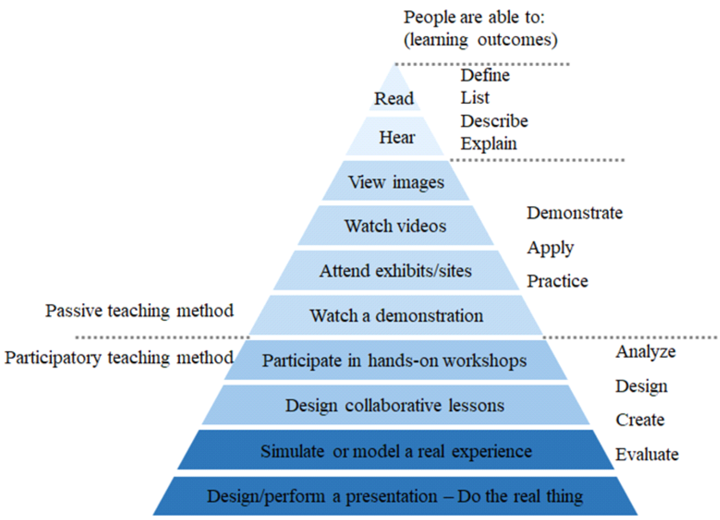
In this study, the extracurricular programs in nursing school were developed by combining the six elements of Jeffries Simulation Theory (context, background, design, simulation experience facilitator, educational strategy, and educational outcome). The context was divided into learning stages according to the purpose of the educational activity and was displayed with the learning environment in which the activity occurred. The simulation experience was implemented in the extracurricular programs and included clinical practice and problem-solving activities. With regard to design, the learning objectives for each type of learning were presented, and the complexity of the problems to be solved at each stage differed. Fidelity was determined by the similarity of the task to be solved to a real-life problem. The level of participation and interaction of participants and observers differed according to the learning level. The evaluation of the extracurricular programs was conducted based on the outcomes achieved by the learners and the results obtained by the institution through the educational programs.

The standard for the performance evaluation and practicum required at each stage was converted into the ratio of the total practicum time suggested by Jeffries (2005). The number of students per class, student-to-faculty ratio, and the appropriate ratio of students when constructing a scenario for effective learning were based on the accreditation standards for the curriculum operation and practicum education stipulated by the Korean Accreditation Board of Nursing Education (KABONE, 2021).

The extracurricular program includes a variety of activities, such as practicum, problem-solving, and team research; however, the primary purpose of the program is to provide a problem-solving-based learning experience. PBL is a commonly used student-centered teaching strategy that enhances the learning experience (Rideout et al., 2002) and helps students improve learning by actively engaging in and solving real-life problems based on scientific knowledge (Niemer et al., 2010). However, PBL and PjBL are often conflated. In this study, the criteria for classification were supplemented based on the differences between the two types of learning.

In PBL, learning occurs through solving problems in an established situation and involves a process of solving challenges or working on cases that learners face or may face through collaborative learning with other students in a small group. PjBL, in contrast, is a teaching model that is used to plan, implement, and evaluate a project that has real-world applications beyond the classroom. PjBL facilitates the discovery of essential problems in complex topics and focuses on developing strategies and solutions to the identified problems (Anazifa & Djukri, 2017). PjBL is characterized by the construction of integrated knowledge through continuous and in-depth exploration of a topic. PBL, however, focuses on the process of reflective thinking and emphasizes the process of solving problems by reasoning theoretically, whereas PjBL focuses on solving problems realistically and practically, with an emphasis on the practical aspect that produces specific outcomes. In other words, PjBL can be viewed as an extended concept of PBL (Larmer, 2015), but with higher problem complexity and fidelity.

The teaching method determines the roles of learner and instructor. Learning takes an explanatory approach or an empirical approach depending on the proportion of the learners' intervention. Through the Cone of Experience, Dale (1946) visualized the extent to which memories are maintained, depending on how learners access information. The base of the cone is characterized by more concrete and realistic experiences, such as direct experience, artificial experience, and role-playing, whereas the midsection is characterized by the observation of more abstract experience. Toward the top, there is a lower level of experience that does not directly interact with reality (Davis & Summers, 2015). As a high level of experience implies a high level of engagement, the cone of experience can provide information on the learner's level of engagement. Thus, depending on whether the teaching method is explanatory or empirical, the level of learner participation and the ratio of the instructor's intervention, or the role, are determined. In this study, learner participation was classified into 10 levels based on the Cone of Experience (see [figure 2]).



〔Figure 2〕 Dale's Cone of Experience
Source: Dale, as cited in Davis & Summers (2015), p. 2.

Ⅲ. Methods

1. Design

The indicators developed are based on Kirkpatrick's 4-level evaluation model, and the learning process is designed by incorporating components of the Jeffries Simulation Theory. In addition, the teaching strategy was combined with PBL, and the learning environment and operating standards were specified based on the design characteristics of the simulation and the accreditation standards of KABONE. Based on the theoretical framework, a draft evaluation model and detailed indicators for the extracurricular program were developed, and the preliminary version was completed based on subject matter expert opinion on the relevance and appropriateness of learning areas, components, and terminology. The preliminary indicators consisting of 3 L-stages, 7 E-stages, 8 A-stages, and 9 P-stages were derived.

The evaluation system and indicators were revised and supplemented by collecting opinions that were deemed appropriate in light of descriptive statistics and content validity ratio (CVR) values. It also includes the expert opinions pertaining to the parts that must be supplemented for the development of the evaluation system and evaluation behavior indicators for the extracurricular programs. The comments, after being grouped based on content, were broadly divided into those that clearly distinguish the learning stages and those that require supplementation in terms of practicality.

2. Content validity verification

To verify the validity of the evaluation system and the indicators for the extracurricular programs developed through literature analysis and experts advice (education and nursing field), the content validity verification was conducted that included seven experts with a doctorate (majored in educational technology, educational assessment and measurement) and have at least three years of experience in the field of education. The experts were selected for their experience in developing and evaluating curricula in educational settings. Four of the experts work in the education departments of universities, developing and running extra curricula. The other three are engaged in educational evaluation and performance analysis of educational projects at a university and a national institute for education policy research, respectively.

The survey included questions about the validity of the evaluation system classification criteria, the evaluation indicator area, the indicators themselves, and the sections to be corrected or supplemented in the evaluation system and indicators; the validity was evaluated using a 4-point Likert scale. The survey results were analyzed using descriptive statistics (mean and standard deviation) and CVR, derived from the formula [Ne-(N/2)]/(N/2)], which was proposed by Lawshe (1975). The minimum value of the CVR is determined by the number of panels. Thus, if there are 5 or 10 respondents and the CVR values are .99 and .62, respectively, the content validity is satisfied.

3. Ethical considerations

In order to conduct validation, the research purpose, procedure, voluntary participation, and confidentiality were explained to experts before the survey, and a questionnaire was conducted with participants who agreed to participate. The questionnaire was delivered and retrieved by e-mail. Advisory fees were paid to the experts who participated in the survey.

Ⅳ. Results

1. Validity of the evaluation system

Based on the content validity analysis of the nursing school extracurricular program evaluation system, both the learning and experience stages corresponding to levels 1 and 2 of the Kirkpatrick model were 1.0, indicating high validity. The advanced and performance stages of levels 3 and 4 were both .71, which was lower than the validity of the previous two stages, yet higher than .7, which is considered satisfactory (see <Table 1>).

<Table 1> Delphi survey content validity of the evaluation system

Division	Criteria (learning type)	Evaluation	Performance criteria	Descriptive statistics		
				M	*SD*	CVR
L	Classroom Instruction for Knowledge Acquisition (L)	Satisfaction Evaluation	▪ Satisfaction evaluation of the education provided by the instructor - One-time special lectures, seminars, training, and expert interviews	3.86	.38	1.00
E	Classroom training and low-skill performance assessment for knowledge acquisition, skill improvement, and attitude change (LE)	Performance Evaluation	▪ Satisfaction evaluation of the education provided by the instructor - One-time special lectures, seminars, training, and expert interviews	3.86	.38	1.00
A	Problem-solving projects to gain knowledge, improve skills, or change attitudes (LEA)	practical exercise and task simulations	▪ Finding, selecting, and presenting solutions in problem-solving project groups - Creating and presenting PPTs, videos, card news, competitions, contests, research poster presentations, etc. - Includes at least 50% practical exercise and at least 15% debriefing (provided by instructor) for the entire hour or session	3.43	.79	.71

P	A real-world problem-solving project that applies the knowledge, skills, and attitudes learned (LEAP)	Role-playin g and on-the-job application	▪ Finding, selecting, and solving real-world problems in authentic situations or conditions, centered on problem-based learning (PBL) - Field practice, internship, social problem solving project (with community and agency partners), etc. - Includes at least 65% practical exercise (Including learner-provided 30% performance assessment, 20% practical exercise, and 15% debriefing) and 15% debriefing (provided by the instructor) for the entire time or session	3.43	.79	.71

2. Validity of the evaluation behavior indicators

In the content validity analysis of the detailed evaluation indicators, all of the validity values for the learning stage were 1.0, except on the inquiry into whether there were any assignments within the program. In the experience stage, which determined whether the educational plan and learning outcomes were presented in orientation, and with regard to the number of enrolled students and faculty-to-student ratio, the validity values were .7, and the instructor qualification standard was .43, which did not reach the minimum value. In the advanced stage, the validity of practicum hours and learning outcomes were both high at 1.0, and the validity of the remaining indicators was reported as .71. In the performance stage, the content validity value of the implementation under realistic conditions—No. 6 for the practicum rate, and No. 9 for the outcome indicator—was 1.0, and the validity values for remaining indicators were .71. The validity of most of the data exceeded .7, which was considered satisfactory, and the indicators that did not meet the minimum standards were excluded (see 〈Table 2〉).

<Table 2> Delphi survey content validity of the behavioral performance metrics

Division	Behavioral performance metrics	Descriptive statistics		
		M	*SD*	CVR
L (Learn)	1. Is it a short, one-off, classroom-based program?	3.86	.38	1.00
	2-1. During the program, does the instructor actively provide knowledge, information, and skills (demonstrations) to the learner? 2-2. Do learners participate at levels 1-2 (reading, listening)?	3.57	.53	1.00
	3. Are there any additional assignments for learners to do after the course (One-time training with no pre- or post-assignments)?	3.71	.76	.71
E (Experience)	1. Is the program a mixture of short periods of instruction and performance assessment?	3.71	.49	1.00
	2-1. During the program, does the instructor provide the learner with knowledge, information and skills (demonstrations) and then assess their performance? 2-2. Do learners participate from level 1 to 6 (reading/listening to performance evaluation)?	3.57	.53	1.00
	3. Have the learning outcomes for the course been established in the orientation and stated in the syllabus?	3.29	.76	.71
	4. Is performance assessment of learning content more than 30% of the total time or sessions?	3.57	.53	1.00
	5. Is the instructor a full-time faculty member or a dedicated person with appropriate qualifications (e.g., nursing licence)?	3.33	1.21	.43
	6. For classroom instruction, are there 80 or fewer students accepted, and is the instructor-to-student placement ratio maintained at 1:25 or less at the time of performance assessment (practicing assistantships available)?	3.43	.79	.71
	7. Are there any products that demonstrate learning outcomes? (Low-skill outcomes)	3.71	.49	1.00
A (Advance)	1. Is it a problem-solving program with more than three sessions (less than 24 hours)?	3.43	.79	.71
	2. Does the instructor provide learners with a structured or semi-structured (How similar to real-world environments) project environment? 2-2. Does the instructor provide managed guidance to learners? 2-3. Do instructors provide debriefing and feedback to learners? 2-4. Are learners engaged on a scale of 1-8?	3.29	.76	.71
	3. Have the learning outcomes for the course been established in the orientation and stated in the syllabus?	3.29	.76	.71
	4. Are the instructors full-time faculty or dedicated staff with appropriate qualifications (e.g., nursing licence, practicum career)?	3.29	1.11	.71
	5. Do the practicum (simulations) that learners do take up more than 50% of the total time or sessions?	3.71	.49	1.00
	6. During practicum (simulation), is the instructor-to-student ratio 1:25 or less, and are learning small groups kept to 8 students or less?	3.29	.76	.71
	7. Does instructor-provided debriefing and feedback account for more than 15% of the total time or sessions?	3.29	.76	.71
	8. Did students present (submit) and share the products of their	3.86	.38	1.00

	problem-solving activities (e.g., project reports, training satisfaction, reflection journal, etc.)?			
P (Perform)	1. Is it a real-world, problem-solving program that runs regularly for 7 or more sessions (less than 56 hours)?	3.14	1.07	.71
	2-1. Does the instructor provide learners with an unstructured project environment? 2-2. Does the instructor provide learners with performance-based guidance and encouragement? 2-3. Do learners participate autonomously on a scale of 1-10?	3.57	.79	.71
	3. Have the learning outcomes for the course been established in the orientation and stated in the syllabus?	3.29	.76	.71
	4. Are the instructors full-time faculty or dedicated staff with appropriate qualifications (e.g., nursing licence, practicum career)?	3.29	1.11	.71
	5. Will the project be carried out under realistic conditions?	3.86	.38	1.00
	6. Are the practicum (simulations) performed by learners more than 65% of the total time or sessions?	3.57	.53	1.00
	7. During practicum (simulation), is the instructor-to-student ratio 1:25 or less, and are learning small groups kept to 8 students or less?	3.29	.76	.71
	8. Does the amount of debriefing and feedback provided by instructors and learners each account for more than 15% of the total time or sessions?	3.29	.76	.71
	9. Did students present and share real-world applications (e.g., project reports, training satisfaction, reflection journal, etc.) of problem solving?	3.86	.38	1.00

3. Subject matter expert comments

According to the purpose and characteristics of education, subject matter experts proposed that the evaluation indicators in the advanced stage corresponding to level 3 and the performance stage corresponding to level 4 be distinguished more clearly.

In terms of learning outcomes, PBL focuses on outcomes that demonstrate learning activities, whereas PjBL emphasizes tangible products that are created through problem-solving activities. To distinguish among the learning stages, specific examples of learning outcomes were added, and the learning outcomes were presented in terms of student competency and program operation based on Kirkpatrick's 4-level model. In stage L, learning satisfaction with the provision of knowledge and information was measured. In stage E, the knowledge and skills acquired through the learning experience presented by the instructor within the program were evaluated. As learners perform problem-solving tasks, their problem-solving ability and creativity improve, which is subject to evaluation in stage A. Moreover, achievements obtained through external activities are used to evaluate the performance of activities. Stage P focuses on the field application of the learning content and evaluates the critical-thinking ability of the learners during their participation in the educational program. The operating organization can confirm the outcome of the educational programs by evaluating whether the learners participating in the program show adaptive outcomes in the actual working environment.

With regard to the need for supplementation in terms of practicality, the initial recommendation was to use a qualitative expression rather than a specific number for the scalability of the educational programs. Accordingly, the restrictions on rounds and time in the learning type were replaced with periodicity and learning activities, and the indicators that presented the number of students enrolled per course and the faculty-to-student ratio were changed in accordance with the recommendations. In addition, the ambiguity of indicators was resolved by adding detailed descriptions and examples of the roles and learning activities that were required in the learning stages. The final version of the nursing school extracurricular program evaluation behavior indicators comprised eight components and 35 questions, and the result indicators were summarized in terms of outcomes from the learning process, student competency, and operating organization (see <Table 3, 4>).

<Table 3> Evaluation of behavioral indicators for the LEAP learning stage in nursing schools

	Learning	Experience	Advance	Performance
1. Learning type	• 1. Is it a one-time lecture-type program?	• Does the program include lectures and learning activities?	• Is it a regular problem-based learning (PBL) program (within 24 h in total)?	• Is it a regular project-based learning (PjBL) or on-the-job program (within 56 h in total)?
2. Learning environment	• 1. Are the classes held in a classroom, or are they a remote class similar to a classroom environment (no limit on the number of students in a distance class)? • 2. (Recommended) Is the number of students for the lecture-type class less than 200?	• 1. Does the instructor provide learners with learning activities (e.g., practice, demonstration, quiz, etc.) for the learning experience? • 2. (Recommended) Is the number of students for the lecture-type class less than 200, and is the faculty-to-student ratio maintained at 1:25 or less during learning a	• 1. Does the instructor provide the learners with a structured or semi-structured learning environment (learning scene, work schedule, work system, and problem-solving task)? • 2. (Recommended) Is the faculty-to-student ratio maintained at 1:25 or less during practical (simulation) activities, and is the size	• 1. Does the instructor provide learners with an unstructured project environment (learning scene, work schedule, work system, and problem-solving task)? • 2. Is the project conducted under realistic conditions? • 3. (Recommended) When the project is in progress, is the size of the learning small group no more than

		ctivities*? (Teaching assistants can participate) *Learning activities: low-skilled tasks such as simple practice, experiment, quiz, problem-solving, and exam.	of the small study group no more than 8 participants?	8 participants, and does it include advisors and clinical experts?
3. Faculty participation	• Does the instructor actively provide knowledge, information, and theoretical explanations to learners when conducting the program?	• When implementing the program, does the instructor first provide the learner with knowledge, information, and skills (demonstration) and then provide the learning experience?	• Does the instructor provide management guidance to learners (presentation of planning, implementation, and evaluation methods)?	• Does the instructor provide performance evaluation-oriented guidance and encouragement to learners?
4. Student participation	• Does the learner participate at level 1 or 2 (reading/listening)?	• Do learners participate from level 1 to 6 (reading/listening to performance evaluation)?	• Do learners participate in various levels from 1 to 8 (reading/listening, performance evaluation, practice demonstration, group discussion, case technique, problem diagnosis, role-playing, and PBL)?	• 1. Do learners participate in the planning, implementation, and evaluation of problem-solving projects? • 2. Do learners participate autonomously at levels 1 to 10 (reading/listening, performance evaluation, practice demonstration, group discussion, case technique, problem diagnosis, role-playing, and PjBL/action learning)? • 3. Does the reflection, discussion, and feedback provided by the learner on the project account for more than 15% of the total time or session?
5. Faculty-student Interaction	• Is there a low level or no interaction (Q &A) between the instructors and learners?	• Is there any interaction (Q &A, low-level assignments, providing results, etc.) between the instructor and learners?	• Does the instructor-provided reflection, discussion, and feedback account for more than 15% of the entire time or session?	• Does the instructor provide reflection, discussion, and feedback to the learners?

<Table 4> Performance indicators for the LEAP learning stage in nursing schools

	Learning	Experience	Advance	Performance
6. Educational operation	• Is it a 100% lecture -style class?	• Does the performance evaluation of learning content account for more than 30% of the entire time or session?	• Does the practicum (simulation) performed by the learner account for more than 50% of the entire time or sessions?	• Does the practicum (project) performed by the learner account for more than 65% of the entire time or session?
7. Educational outcome	• Is there a result for evaluating learner satisfaction with the learning content provided by the instructor?	• Are there any evaluation results of learners' understanding of the content provided by the instructor (e.g., quiz, problem-solving, written or practical test, etc.)?	• Are the results of PBL (e.g., PPT, video, card news, research poster, study group activity report, design thinking result report, etc.) presented (submitted) and shared?	• Are the results of applying problem-solving to the actual field presented (submitted) and shared (e.g., project report, training participant satisfaction, work log, reflection journal, etc.)?
8. Outcome (result)	• Satisfaction evaluation	• Results of learning activity (quiz, problem -solving, test results, etc.)	• Results of PBL activity (study group report, research plan/poster, design thinking report, reflection journal, etc.)	• Results of PjBL activity (project report, work log, training participant satisfaction survey, etc.)
Student competency	• Learning satisfaction, academic self-confidence	• Knowledge of the learning content and evaluation of clinical skills	• Self-efficacy, creativity, and problem-solving ability	• Learning transfer intention • Critical thinking ability
Operational aspect	• Education satisfaction survey	• Pre-test and post-test	• Major satisfaction and external activity performance	• Quality of employment and field adaptation evaluation

Ⅴ. Discussion and Conclusion

Competency education has been enhanced to cultivate comprehensive practice skills for nursing clinical performance (Wu et al., 2014), and universities have implemented a variety of extra-curricular programs to support students' development of competencies related to their professional domains (Bakoban & Aljarallah, 2015; Griffiths et al., 2021; Rubin et al., 2002; Wood et al., 2011). Quality control in extra-curricular programs is important for the development of student competencies. The purpose of this study was to develop a learning outcomes framework and assessment indicators for the extra-curricular programs in a nursing school based on the Kirkpatrick model's learning stage. In particular, by aligning the components of Jeffries' simulation theory, which is used in educational programs in the field of nursing, with the Kirkpatrick's four-level model, it was possible to design a systematic extra-curricular programs including teaching strategies, activity implementation, and evaluation appropriate for nursing education. In addition, by evaluating educational performance at the student and organizational levels, we aimed to obtain information for learning improvement and establish a quality management system through feedback.

The evaluation system for the nursing school extracurricular programs developed in the present study is divided into learning, experience, advance, and performance stages in accordance with the educational goals, and each stage corresponds to Kirkpatrick's 4-level model. The learning stage corresponding to level 1 of the Kirkpatrick model is characterized by instructor-centered lecture-type education that is aimed at the learner's understanding of knowledge and concepts in a specific field, and the effectiveness of the program is judged by reaction evaluation, such as satisfaction. The experience stage corresponding to level 2 provides low-level experiential activities that promote learning for skill improvement as well as the acquisition of knowledge in a specific field. The evaluation is carried out on the knowledge and performance of low-skill-requiring tasks. The advanced stage, which corresponds to level 3, seeks to deepen knowledge, improve skills, and change the attitude in a specific field, and PBL is adopted as the learning method. In the process of problem-solving, attitudes of collaboration, teamwork, and critical literature evaluation are formed, which are evaluated as an outcome of PBL. The performance stage goes beyond the educational goals of the previous stages and focuses on practical application, and learning takes place through participation in field-applied projects. The effectiveness of the educational program is verified through the results of PjBL.

The evaluation of behavioral indicators was designed based on the components of the Jeffries Simulation Theory. The eight factors—learning type, learning environment, faculty participation, student participation, faculty–student interaction, educational operation, educational outcome, and results—correspond to the components of the Simulation Theory presented by Jeffries. Each component is placed according to the learning stages, and the closer one is to the final stage, the greater the fidelity and complexity of the learning activity. Moreover, 35 indicators were developed in eight components, excluding the outcome, and each learning stage consists of eight L, E, and A stages, and 11 P stages. By organizing learning objectives, the teaching-learning practices, and learning outcomes according to the evaluation criteria, the quality of extracurricular programs was effectively managed through the modulation of individual evaluation indicators.

The field of nursing education is in need of finding ways to integrate simulation into the nursing curriculum to develop students' competencies and to develop learner-centered pedagogies that engage students in the clinical environment (Jeffries, 2008). This study combines Kirkpatrick's four-level evaluation model with Jeffries' theory of simulation to establish an evaluation systems and develop evaluation indicators for a extra-curricular program in nursing school. The significance of this study is that it attempts to extend the theory by applying simulation theory to the context of extra-curricular, as efforts are needed to apply simulation theory to various learning contexts. In addition, by organising the educational outcomes that were lacking in Jeffries' theory at the individual and organisational levels according to the level of learning, reference indicators for the outcomes of competency education were presented.

Indicators of performance can be used as a basis for intervention for program quality management and as indicators for program accreditation and effectiveness assessment. Especially, universities offering mileage as a means of encouraging students to participate in extra-curricular programs may be able to improve the efficiency of their programs by using learning stage alignment and assessment metrics as a basis for awarding mileage. Through a continuous feedback loop of educational assessment into quality improvement, the institution will ultimately be able to support student development and help nursing graduates adapt and engage in the workplace.

In subsequent research, the evaluation system and indicators developed in this study should be used in educational operation sites to verify the effectiveness of the indicators. The effectiveness of the evaluation feedback system should be verified by analysing the impact of a series of educational practices, such as teaching-learning methods, learning activities, and teacher-student interactions, on educational performance, and improving educational programs according to the operational results. In addition, problems encountered in the use of evaluation indicators should be examined to improve the validity and completeness of evaluation indicators.

For example, during the program approval and accreditation, issues may arise due to conflicting interests between operational entities, and during performance evaluation, there may be demands for improved metrics from students, instructors, and operational organisations. Refinement of the indicators should include input from various stakeholders involved in the educational program. In addition, quantitative information should be supplemented to improve the validity of the indicators and increase their utilisation. The currently developed metrics only provide descriptions to distinguish between learning stages. Utilisation can be improved by assigning a score based on the importance of each indicator and giving a pass/fail if a certain score is met. Indicators with low importance can be removed through expert review, which increases the validity of the indicators. In addition, we suggest developing common indicators, taking into account the opinions on setting basic requirements for extra curricula, as suggested in the expert subjective comment of this study.

Despite these limitations, this study is useful in that it establishes research questions based on the operational challenges of design-based extra-curricular programs offered by universities, and provides evaluation guidelines for quality control of extra-curricular programs offered by higher education institutions. In addition, by providing an example of the development of an extra-curricular assessment system that reflects the specificities of the discipline, we have argued for the need to consider disciplinary teaching practices in the construction of extra-curricular systems. There is also a benefit in terms of the versatility of the metric, as the Jeffries simulation theory used in this study can be used in other disciplines where clinical practice is essential, such as nursing, medical, physiotherapy and occupational therapy.

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