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Development and Evaluation for Active Learning Instructional Design of Epidemiology in Nursing Informatics Field

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Abstract. Nursing education classes are classifiable into three types: lectures, classroom practice, and clinical practice. In this study, we implemented a class that incorporated elements of active learning, including clickers, minutes papers, quizzes, and group work and presentation, in the subject of "epidemiology", which is often positioned in the field of nursing informatics and which is usually taught in conventional knowledge-transmission style lectures, to help students understand knowledge and achieve seven class goals. Results revealed that the average scores of the class achievement (five levels of evaluation) were 3.6–3.9, which was good overall. The highest average score of the evaluation of teaching materials by students (five levels of evaluation) was 4.6 for quizzes, followed by 4.2 for announcement of test statistics, 4.1 for clickers, and 4.0 for news presentation related to epidemiology. We regard these as useful tools for students to increase their motivation. One problem with the class was that it took time to organize the class: creation of clickers, and writing comments on small papers.

Keywords. Active Learning, Epidemiology, Instruction Design, Clicker

1. Introduction

Classes in nursing education are classifiable into three types of lecture, classroom practice, and clinical practice. In this study, we implemented a class that incorporated elements of active learning, including group work and presentations, clicker, and minutes papers (paper-based class portfolio), in the subject of "epidemiology," which is usually taught in conventional knowledge-transmission style lectures.

Epidemiology has historically developed as a methodology associated with the prevention of diseases. Today, it has practical purposes in public health nursing that not only analyzes diseases in specific human populations such as regions, occupations, and schools, but also analyzes the distribution of health-related events and associated and influencing factors and controls health-related events based on the obtained knowledge. Epidemiology is included in the scope of the National Examination for Public Health Nurses. In addition, the way of thinking and the research methodology are the bases of providing evidence-based nursing and fundamental knowledge for conducting nursing research. However, because the content is conceptual, it is said to be difficult for

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nursing students to understand technical terms with which they are not familiar. In previous study, the research of thinking out a better method for epidemiologic class is not found. For that reason, to help understand knowledge of epidemiology and to support the achievement of class goals, we designed a blended class using many active learning methods including clickers using ICT, etc.. This paper describes the instructional design to increase student's motivation and considers the effectiveness based on class evaluation by them.

2. Previous Study

2.1. Implementation of Active Learning in Nursing Education

The ability to engage all students actively in a large classroom is challenging and increasingly difficult because the number of nursing students has increased.

The project explored how an audience response system (clickers), combined with case-based questions, caused increased student engagement, attention, and participation in an introductory clinical nursing course [1].

2.2. Implementation of Active Learning in Epidemiology Education

In epidemiology education, only one report [2] presents the possibility that the use of clickers might influence students' self-evaluation of overall understanding of the lectures.

3. Implementation Methods for the Class

3.1. Target subject

This paper reports the implementation of epidemiology class held in the second semester of 2014 (the second semester of junior year, a compulsory subject). The goal is to select students for the public health nurse courses. Students who took the class were 107; 106 of them attended the class through the last day.

3.2. Specific class tools

- 1) Class orientation: The syllabus had been registered in the university's database beforehand. Additionally, we provided guidance during the first session of the class. Not only the topic of each lecture, but also today's news presentation by group, peer review, test, class portfolio, and creation of journal notes were presented in the 15-session class plan. We urged students to do preparation for technical terms to become familiar with them because the focus of explanation in the class would be on the textbooks.
- 2) Structure of each session of the class: The structure and the time allocation of each 90-minute session of the class were presented. This enabled students to participate in the class, understanding the progress of the class.
- 3) Active learning methods: Mizokami considers methods of active learning by

dividing lectures into lecture-style and practice-style classes [3]. We organized them into a list and marked the methods that we introduced to the class (Table 1).

		Content	Implementation	Tool
Learning process	Lecture style	Have students write comments/ questions Reflection	0 0	Class portfolio Peer review
		Debate Response analyzer	0	Clicker
	Practice style	Data collection Interview/ questionnaire/ experiment	0	Task presentation
		Production	0	My note, Question- posing (quiz)
		Field observation		
		Group discussion	0	
		Group learning	0	Today's news present-
		Presentation	0	ation,
		Question and answer with teachers / other students	0	Question PPT

Table 1. Active Learning Implemented in the Class

We used slightly thicker colored paper for the class portfolio and peer review related to news presentation because they were to be used in every session and needed to be distinguished easily from other documents.

The class portfolio was designed to fit on a sheet of paper using both sides to show the attendance status for 15 sessions of the class at a glance. Furthermore, for students themselves to manage the goals, we had students write their own class goals to be achieved in the first session after the class guidance and the achievement in the last session. Although these are similar tools, shuttle-card "*Daifuku-cho*" [4], it is particularly different in the point that ours is designed to record the "understanding" on a scale of 1–5, separating the "understanding at the time of preparation and that after the class".

The form of peer review evaluation on today's news presentation was designed to be able to record not only the evaluation of presentations, but also the classification of survey methods, considering that students would learn epidemiological survey methods during the latter half of the class.

Additionally, we introduced the use of clickers to grasp diverse opinions and conditions of students taking the class, as well as review tests (quiz and test) and group question-posing, which was posted on the home page after creating and sending via email, to fix their knowledge. With regard to question-posing, we made it known to students that good questions might be used for each test, which raised their motivation.

3.3. Evaluation methods for learning results

To achieve the class goals, we evaluated learning results as follows. (1) Fixation of knowledge: Quiz and test 80%

- (2) Attitude about the class: Class portfolio 10%
- (3) Submission of tasks: Question-posing and today's news 10%

4. Discussion

4.1. Evaluation methods

In the last session of the class, an anonymous, self-administered questionnaire survey was given. We provided an oral explanation to students that the survey was designed to improve the class and that results might be reported at conferences. We asked them to submit the questionnaire by their own free will. The questionnaires were distributed to 103 students who attended on the day. The number of questionnaires collected was 101 (98.1% collection rate).

4.2. Results of class goals

Table 2 presents the five levels of evaluation results as to whether each of the seven class goals was achieved or not. The highest personal average score was 5 points; the lowest was 2 points. The 90% of students assigned scores higher than 3. It is readily apparent that many had been achieved class goals. Students had the best understanding of the concept of epidemiology and the basic terminology, which seems to have led them to understand the importance of epidemiological perspective in public health nurse. Particularly we think that because risk factors by which students who are bad at mathematics often stumble were understanding was further deepened through the review in the next session of the class and repeated questions in quizzes.

However, 11 students (10.9%) assigned a score lower than 2 for at least one goal. The goal with the lowest achievement was Goal 5: "Able to explain main population statistics and health statistics". Ten of the students were included here. This is a learning item in other subject. Therefore, cooperation between subjects is regarded as necessary.

4.3. Results of active learning methods

With regard to the seven methods, the five levels of evaluation results are presented in Table 3 as to whether they were used for the promotion of learning, motivation for learning, and achievement of the class goals. The highest personal average score was 5 points; the lowest was 1.6 points. Most methods were evaluated as scoring higher than 3. However, a lot of students assigned scores lower than 2 only to the home page for quiz learning, which revealed that it was not used very much. Furthermore, students who gave a score lower than 2 for at least one of all methods were 35 (34.7%); 30 of them did not use the home page for quizzes.

Opinions commonly found in free descriptions were the following: "Clicker was interesting"; "It was easy to understand because a quiz was provided in each session"; "I was happy to get a comment to the class portfolio every time"; and to create quizzes was "beneficial", or conversely "a burden." In addition, an opinion that "It was an easy-to-understand class because it had concrete examples and slides with main points"

was commonly shared. Moreover, there was an opinion that "I will mainly use textbooks and class notes for the national examination." We think the following points led to visualize learning results and presented a clear idea of learning methods for the national examination two years later: conducting the class and tests particularly addressing the textbooks; and having students create journal notes.

Finally, the student whose self-evaluation was the lowest gave the following comment: "It was difficult and full of content, but I think that I was taught in an easy to understand manner. I was glad that you looked at the portfolios carefully. I wish I could have been more interested in epidemiology." Challenges remain for how to arouse students' interest in epidemiology.

Class goals	Average score	
1 Able to understand and explain the concept and basic terminology of epidemiology		
2 Able to explain plague frequency and risk, or effective indicators	3.7 ± 0.7	
3 Able to explain survey methods in epidemiology	3.6 ± 0.8	
4 Able to explain the principle and method of group medical examinations	3.5 ± 0.7	
5 Able to explain main population statistics and health statistics		
6 Able to explain main diseases' frequency and distribution, and risk factors and		
prevention		
7 Able to explain the importance of an epidemiological perspective in public health nurse		
activities		

Table 2. Achievement of Class Goals (Average)

Tool	Average score
1 News presentation on epidemiological survey	4.0 ± 1.0
2 Quiz and test	4.6 ± 0.7
3 Class portfolio	3.9 ± 0.9
4 Announcement of test statistics	4.2 ± 0.9
5 Clicker	4.1 ± 1.0
6 Quiz creation	3.8 ± 0.9
7 Quiz home page	3.2±1.2

 Table 3. Evaluation of Active Learning Methods

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