〈Others〉

Learner needs assessment through active learning development: A trial at Kawasaki Senior High School Attached to Kawasaki Medical School

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ABSTRACT Active learning initiatives are implemented to enhance learning outcomes, but some efforts yield insufficient results. For improving active learning outcomes, learners' positive participation is crucial. To foster learner motivation in active learning, creating experiences that align with learners' needs is effective. Therefore, evaluating their needs is essential, yet such evaluations have not been conducted adequately. To better understand the learner needs, we facilitated development of active learning activities by the learners themselves. Specifically, this study used inquiry-based learning with a group of Second-year high school students supported by collaborative guidance from high school and university educators. To assess student perceptions and learning needs, data were collected through written surveys, and statistical significance was evaluated using Student's t-tests ($p < 0.05$). As part of this process, the Second-year students designed anatomy games, making it evident that learners prefer to engage with learning material in an enjoyable way. Thus, this paper reports the effectiveness of active learning tailored to reflect learner needs.

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INTRODUCTION

In recent years, schools have been encouraged to incorporate *active learning* into their educational practices, an instructional method that requires students to engage in meaningful learning activities and reflect on their actions[1)]. In fact, many kinds of active learning have been reported as effective[2)], depending on various factors but mainly on students' active participation. To enhance student motivation, developing engaging active learning

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experiences is an essential but challenging endeavor. Indeed, much research indicates that educational programs tailored to learners' needs can boost their motivation. Therefore, although teachers must design learning programs responsibly, they should also consider both learners and society's needs[3, 4].

To identify students' needs, we involved them in creating active learning experiences in a high school inquiry-based class in which they designed a game-based approach to learning anatomy and revealed that they preferred learning in an enjoyable manner. Therefore, this study highlights the importance of developing educational programs that address learner needs.

MATERIAL AND METHODS

Research collaborators

Second-year students at Kawasaki Senior High School attached to Kawasaki Medical School, engaged in inquiry-based learning. Nine First-year high school students volunteered to participate in a study that evaluated the effectiveness of an active learning approach designed by Second-year students.

Curriculum

A class using an active learning, inquiry-based approach was conducted for second-year students at Kawasaki High School. Active learning is a teaching and learning method designed to engage learners in an active role in their learning[1]. In this curriculum, students are divided into groups of two to four and each group conducts research on a specific topic throughout the year. The course consists of one hour of class per week, totaling 30 hours. High school and university teachers facilitated students' learning by providing ongoing guidance. Students and faculty discussed selection of research themes, for example, "Evaluating the Accuracy of Chat GPT," "Analysis of the Effects of UV Rays on Fruit Peels," and "Development of Active Learning for Basic Medical Sciences" upon which this study focuses.

Written survey

Two types of written surveys were conducted (Table 1). The first gathered volunteer students' impressions of active learning. The second was a learner needs assessment, administered to students who had earlier developed the active learning activities.

Statistical analysis

Statistical analysis was performed using the Student's t-test, with a P-value of less than 0.05 indicating statistical significance.

RESULTS

Selection of study subjects by the learners

Within basic medical sciences, learners selected anatomy as a concentration. Students chose 30 human bones including the patella, tibia, and radius, among others, and established active learning goals to memorize their names in Japanese and English.

Active learning development by the learners

To facilitate active learning and memorization

Table 1. Contents of the written survey

Questions for Student Volunteers	
1	Did you enjoy this game?
2	Which did you find easier to remember: the card game or traditional memorization methods?
3	Please let us know if there are any aspects of the card game that could be improved.
4	Besides the card game used in this activity, what other types of games do you think could be useful for learning?

Questions for the Students Who Developed the Active Learning Activity	
1	Why did you choose anatomy as your topic within basic medical sciences?
2	How would you like to learn anatomy?

The two types of questionnaires that were administered are shown. The four questions in the upper section are for the student volunteers. The two questions in the lower section are for the students who developed the active learning activity.

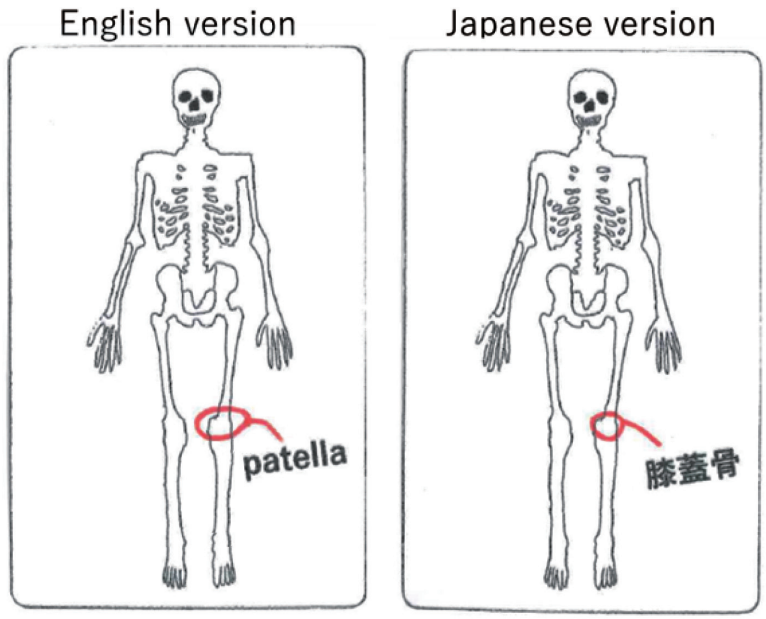

Fig.1. Card samples
Here is an example pair of anatomy cards with the English version on the left, and the Japanese version on the right.

of the bones' anatomical names, students created an anatomy game following the standard rules of concentration, as summarized below. For each of the 30 bones, two cards were prepared: one illustrating the bone and the other displaying its name in Japanese on one side and in English on the other (Fig. 1).

Before beginning the game, the players determined the order of play and shuffled all the cards face down. The first player flipped over two cards to reveal an individual bone's illustration on one card and a bone's name on the other. If the two cards matched, the player kept them and flipped two more cards. The player kept playing until selecting a mismatched pair, at which time the player returned the mismatched cards to their original positions. The first player's turn then ended, and the next player took a turn in the same manner. Once all the cards were matched, the player with the most cards was declared the winner.

Analysis of effectiveness

The game's effectiveness as active learning was evaluated as follows. Nine volunteer students played the game for 15 minutes and were then tested on their knowledge of bone names. For comparison, they were also given a list of bone names to memorize in 15 minutes, followed by the same test. To prevent any advantage in later examinations, the group of bone names was altered so that the 30 bone names were divided into two sets: 15 for the game and 15 for memorization[5)]. In the examination, 10 questions were drawn from the total of 15 bones and graded on a scale of 10 points. Results indicated that students who memorized using the game scored significantly lower than those who used the lists (Fig. 2).

Conversely, all students expressed that learning through games was enjoyable. These results indicate that although this game-based learning was less effective than list-based learning, it was certainly

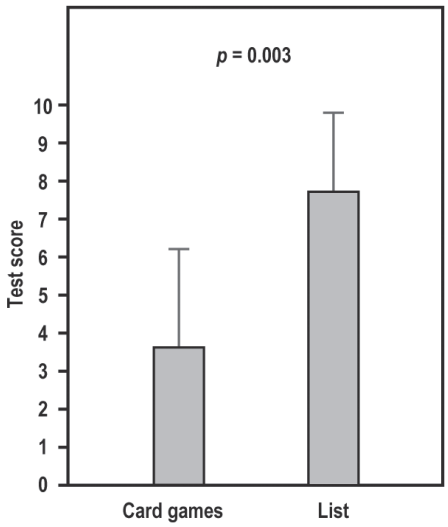

Fig. 2. Test score comparison
Nine volunteer students' test scores are presented. After playing the card game for 15 minutes, students were tested on their knowledge of bone names. They then had another 15 minutes to memorize a list of bone names before being tested again. Each learning method used a unique set of 15 bone names, with 10 names selected for each test. Error bars represent the standard deviation, and statistical analysis was conducted using the Student's t-test, with a significance level of $p < 0.05$.

more enjoyable.

Learner needs assessment

Thus, the learners' needs assessment has shown that they desire to master complex subjects while enjoying the process. Learner feedback included the following: "I want to learn in an enjoyable and fulfilling way, and I also want to experience learning in a group." Another stated, "I want to discover the optimal learning method for myself and master it completely."

CONCLUSIONS

In this study to assess learner needs, students developed active learning experiences. After this development, the needs assessment indicated that learners desire to study complex subjects in a manner that is effective and enjoyable. Thus, students designed educational games as a form of active learning to facilitate their understanding of anatomy while having fun.

The concept of learning in an enjoyable manner is known as "edutainment." Merging "education" and "entertainment," as coined by Robert Heyman of the American National Geography Academic Union[6], "edutainment" refers to entertainment's integration into educational practices, and it is being implemented across various educational fields[7]. Reports indicate that edutainment anatomy games have been effective learning methods[8, 9]. However, edutainment faces criticism for the belief that learning is naturally enjoyable, with some arguing that it consumes too much time in achieving effective learning outcomes[7, 10].

Our anatomy game was found to have low learning efficiency. To enhance its educational impact, we might need to incorporate regular memorization techniques. However, all students reported enjoying the game, suggesting that it effectively promotes active learning tailored to their needs.

This study highlights the importance of providing enjoyable learning experiences for students. Many have noted that educators should take students' needs into account when planning lessons, and they emphasize the necessity of teachers understanding their students' preferences and requirements[3, 4]. Based on the student needs and edutainment issues identified here, creating both effective and engaging active learning experiences may be possible.

Limitations

In this study, we examined whether learner needs could be investigated through active learning developed by learners themselves. Although we were able to obtain insights that are not typically captured through conventional questionnaire-based assessments, it is possible that only the needs that are easily reflected in active learning were revealed. These issues require further improvement in future research.

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CONFLICTS OF INTEREST

The authors have no financial relationships to disclose.

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No applicable matters.

APPROVAL CORD ISSUED BY THE INSTITUTIONAL REVIEW BOARD (IRB) AND THE NAME OF THE INSTITUTION THAT GRANTED THE APPROVAL

Cord No 6779-00, Ethical Committee of Kawasaki Medical University

A STATEMENT THAT APPROPRIATE INFORMED CONSENT WAS OBTAINED

Informed consent was obtained from all students.

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