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Evaluation of Student Learning Outcomes by Using Generated AI in Formative Assessment of University Class

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Abstract: In this study, faculty utilized generative AI as part of formative assessment to evaluate student learning outcomes, and analyzed results using grounded theory. This revealed significant room for improvement in terms of the “depth of analysis,” “breadth of analysis,” “appropriateness of concepts,” and “application of concepts” in student learning.

Keywords: formative assessment, generative AI, far transfer

1. Introduction

Future university education aims to cultivate the ability to respond to unknown situations and complex problems rather than simply memorizing knowledge. At the core of this ability is "distant transfer," which has the potential to improve the quality of university education fundamentally. To promote "distant transfer" among students, it is essential for instructors to analyze students' responses and identify areas for improvement carefully. Here, formative assessment plays a crucial role. Formative assessment refers to the process where instructors provide feedback-based guidance to revise both their instruction and students' learning activities (Black et al., 1998). In other words, specific feedback on students' learning progress leads to precise revisions in instructors' guidance. However, on the other hand, to obtain such feedback on students' learning status, teachers must bear a significant burden in terms of setting tasks that promote distance transfer and providing individual feedback on them, which makes it challenging to implement this approach in large-scale classes. To address this issue, this study aims to utilize generative AI to evaluate student's learning outcomes, analyze the results using a grounded theory approach, and derive specific insights to help teachers connect formative assessment with the promotion of distant transfer.

2. Teaching Practice

The subject of this study is the elective course “Agricultural Economics” offered at professional graduate school in Kansai region. We conduct the actual formative assessment in the final class session. In final class, students engaged in an activity titled “Considering ‘Art’ Using Knowledge of Agricultural Economics.” This activity was designed based on the finding that “the most far transfer occurs between the domains of science and art” (Susan et al., 2002).

3. Research Findings

In this section, we analyze and examine the evaluation results of reports submitted by students on the theme of “Considering ‘Art’ Using Knowledge of Agricultural Economics” using

the grounded theory. Due to space limitations, we will present the results of 10 students selected at random from the 28 students who took the course.

The analysis results reveal five categories: "①depth of analysis," "②breadth of analysis," "③appropriateness of concepts," "④application of concepts," and "⑤novelty of perspective." Regarding ①, this includes specific data, case studies, application of economic theory, and logical rigor. However, many responses pointed out a "lack of depth in analysis," which can be considered a significant weakness. Regarding ②, this includes how well the diverse aspects of the art market (such as investment, appreciation, and market structure) are considered, as well as how broadly related concepts from agricultural economics are applied. On the other hand, some responses were criticized for being biased toward art investment or for applying agricultural economics concepts in a limited manner. ③ focuses on whether appropriate concepts, such as information asymmetry, network effects, and price elasticity, have been selected and defined. Many responses mentioned these concepts, but there were differences in the depth of their explanations. ④ focuses on how the selected concepts are applied to the specific situation of the art market. Rather than simply listing concepts, it is important to use them to explain the characteristics of art market. Many responses were found to be limited to superficial applications. Regarding ⑤, some responses presented analyses from perspectives different from existing research and proposed new hypotheses. A student were praised for their “innovative approaches,” suggesting their high level of creativity and originality.

As a result of further detailed analysis of the above main categories, the following four points can be identified. First, many responses lacked specific data and examples, as well as economic justification. This indicates that the hypotheses and arguments were weak and lacked persuasiveness. Second, although some responses focused on art investment, there was a lack of reference to the diverse aspects of the art market, such as art appreciation and market functions. Third, there are multiple responses where concepts from agricultural economics are merely listed without being effectively used to explain the characteristics of the art market. For example, many cases fail to provide concrete examples to explain information asymmetry. Fourth, while there are innovative attempts like Student B's to apply consumer behavior theory from agricultural economics to the art market, most other responses merely rehash existing frameworks.

4. Conclusion

In this study, faculties utilized generative AI as part of formative assessment to evaluate student learning outcomes, and the results were analyzed using a grounded theory. This revealed significant room for improvement in terms of the “depth of analysis,” “breadth of analysis,” “appropriateness of concepts,” and “application of concepts” in student learning.

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