



## Examining Students' Ability to Identify Cognitive Learning Theories through the Case Analysis Game with Rotation (CAGeR)

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### ABSTRAK

Pemahaman terhadap teori belajar merupakan kompetensi penting bagi calon guru. Namun, mahasiswa sering mengalami kesulitan dalam mengidentifikasi perspektif teoretis yang tercermin dalam situasi pembelajaran yang autentik. Penelitian ini bertujuan untuk mengkaji kemampuan mahasiswa dalam mengidentifikasi teori belajar kognitif melalui aktivitas permainan berbasis kasus yang melibatkan analisis kasus secara bergiliran. Penelitian ini menggunakan desain kualitatif deskriptif. Partisipan penelitian adalah enam belas mahasiswa program studi pendidikan fisika yang bekerja secara kolaboratif dalam empat kelompok. Mahasiswa menganalisis empat kasus pembelajaran yang merepresentasikan berbagai teori belajar kognitif dan memberikan penjelasan tertulis untuk mendukung jawaban mereka. Hasil penelitian menunjukkan bahwa seluruh kelompok berhasil mengidentifikasi teori yang direpresentasikan pada kasus miskonsepsi. Sebagian besar kelompok juga mampu mengenali situasi *discovery learning* dengan benar. Namun, hanya setengah dari kelompok yang mampu mengidentifikasi teori yang berkaitan dengan pengorganisasian pembelajaran dan pemecahan masalah. Temuan ini menunjukkan bahwa mahasiswa lebih familiar dengan situasi pembelajaran yang melibatkan konflik konseptual dan *discovery learning* dibandingkan dengan situasi yang berkaitan dengan struktur pembelajaran dan proses belajar hierarkis. Aktivitas ini memberikan kesempatan bagi mahasiswa untuk menafsirkan situasi pembelajaran dan menghubungkan konsep teoretis dengan praktik pengajaran di kelas.

**Kata kunci:** Teori Belajar Kognitif, Pembelajaran Berbasis Kasus, *Game-Based Learning*, Pendidikan Guru

### ABSTRACT

Understanding learning theories is essential for prospective teachers, yet students often experience difficulties identifying theoretical perspectives within authentic instructional situations. This study aims to examine students' ability to identify cognitive learning theories through a case-based game activity involving rotating case analysis. The study employed a descriptive qualitative design. The participants were sixteen undergraduate students in a physics education program who worked collaboratively in four groups. Students analysed four instructional cases representing different cognitive learning theories and provided written explanations for their answers. The results show that all groups correctly identified the theory represented in the misconception case. Most groups also successfully recognized the discovery learning situation. However, only half of the groups correctly

identified the theories related to instructional organization and problem solving. These findings suggest that students are more familiar with learning situations involving conceptual conflict and discovery learning than with those related to instructional structure and hierarchical learning processes. The activity provided opportunities for students to interpret teaching situations and connect theoretical concepts with classroom practices.

**Keywords:** cognitive learning theory, case-based learning, game-based learning, teacher education

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## INTRODUCTION

Understanding learning theories is a fundamental component of teacher education because these theories provide a conceptual framework for interpreting how students learn and how instruction should be designed. According to Schumacher et al. (2013), knowledge of learning theories helps prospective teachers understand students' cognitive development and design effective learning environments. In science and physics education, theoretical perspectives such as those proposed by Piaget, Bruner, Ausubel, and Gagné continue to influence instructional approaches and curriculum design (Adeduyigbe & Okeke, 2025; Agarkar, 2019; Cakir, 2008). These theories explain how learners construct knowledge, organize information, and apply concepts to solve problems in learning situations. Consequently, prospective teachers are expected not only to understand theoretical concepts but also to interpret how these theories are reflected in classroom practices. Therefore, the ability to connect theoretical perspectives with classroom practices is considered an essential competence for prospective teachers (Hennissen et al., 2017; Yilmaz, 2011).

However, despite the central role of learning theories in teacher preparation programs, many studies report that prospective teachers experience difficulties connecting theoretical concepts with authentic teaching situations (Mahmood & Iqbal, 2018; Setiono et al., 2026). Research in teacher education indicates that students often demonstrate the ability to recall theoretical concepts but encounter challenges when applying those concepts to interpret real classroom practices. This difficulty reflects the persistent gap between educational theory and teaching practice that has long been discussed in teacher education literature (Darling-Hammond et al., 2020; Zeichner et al., 2015). When learning theories are presented mainly through conceptual explanations rather than through analysis of authentic teaching situations, theoretical knowledge may remain abstract and disconnected from classroom practice. Consequently, learning about educational theories may become limited to memorizing definitions rather than developing the ability to interpret instructional practices through theoretical perspectives.

To address this challenge, recent developments in teacher education highlight the importance of active learning approaches that allow students to analyse authentic teaching situations. Case-based learning has been widely used because it encourages students to examine instructional cases and reflect on pedagogical decisions while connecting theory with practice. Through the analysis of teaching scenarios, students are required to interpret instructional situations and consider how theoretical perspectives are applied in real educational contexts. Tobias et al. (2020) report that game-based learning environments can increase engagement and support deeper learning processes through interactive and collaborative activities. In addition, Nadeem et al. (2023) found that game-based learning strategies can enhance student participation and promote meaningful discussion during learning activities, particularly when learners collaboratively analyse complex scenarios.

Nevertheless, although previous studies have reported positive effects of case-based and game-based learning on student engagement and conceptual understanding, limited research has examined how such approaches support students in identifying learning theories embedded in instructional cases. Most studies focus primarily on motivation, participation, or conceptual learning outcomes rather than on students' ability to interpret theoretical perspectives in teaching situations (Addy et al., 2018; Wu et al., 2012). This indicates a need for learning activities that explicitly encourage prospective teachers to analyse instructional situations from theoretical perspectives rather than merely recalling theoretical definitions. In addition, relatively little research has examined how prospective teachers reason about learning theories when they are required to interpret authentic

instructional scenarios collaboratively. Understanding how students identify and justify theoretical perspectives in teaching situations is important because it reflects their ability to connect theoretical knowledge with pedagogical practice. Therefore, this study aims to examine students' ability to identify cognitive learning theories through a Case Analysis Game with Rotation (CAGeR). By analysing students' reasoning when interpreting instructional cases, this study contributes to the literature by highlighting how interactive case-based activities can reveal prospective teachers' understanding of learning theories in authentic teaching contexts.

## METHODS

This study employed a qualitative descriptive research design to examine students' ability to identify cognitive learning theories through a case analysis game activity involving rotating discussions. The focus of the study was to analyse how students interpreted instructional cases and identified the dominant learning theories represented in each case. The research was conducted in a physics education program at a university in West Java, Indonesia. The participants were sixteen undergraduate students enrolled in the Instructional Strategies course in the fourth semester of the 2025/2026 academic year. The participants consisted of nine female students and seven male students, with ages ranging from 19 to 20 years old. The students were organized into four groups consisting of four members each, and each group included a mix of male and female students to encourage collaborative interaction. The researcher acted as the instructor who facilitated the learning activity and observed the discussion process during the implementation of the activity. The activity was conducted during a single class session.

Data were collected through written group responses produced during the case analysis activity. The learning activity used in this study was a case analysis game involving rotating discussions, in which students analysed instructional scenarios representing different cognitive learning theories. Each group analysed one case and recorded their responses to several guiding questions, including identifying the dominant learning theory, explaining the key concepts related to the theory, identifying evidence from the case, and explaining why the case was not better explained by another theory. After a fixed discussion period, groups rotated to analyse another case until all groups had examined all cases, as shown in Figure 1.

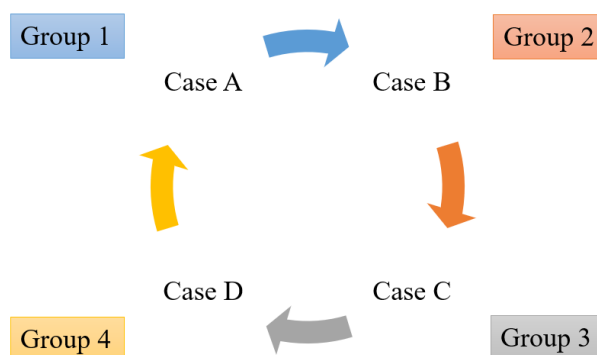


Figure 1. Case Analysis Game with Rotation (CAGeR)

Data were analyzed using descriptive qualitative methods. Group responses were examined to determine the accuracy of theory identification and the reasoning used to support the answers. The analysis involved comparing students' responses with the theoretical framework represented in each case and identifying patterns of correct identification and misconceptions. To ensure the credibility of the findings, theoretical triangulation was applied by interpreting students' responses using established cognitive learning theory frameworks, particularly those proposed by Piaget, Bruner, Ausubel, and Gagné. In addition, the interpretation of the data was discussed among the researchers to minimize potential bias and strengthen the credibility of the analysis.

## RESULTS

### *Accuracy of Learning Theory Identification*

Students' ability to identify cognitive learning theories was examined through four instructional cases analysed during the case analysis activity. Each group provided written responses identifying the dominant learning theory represented in each case. The accuracy of theory identification across the four cases is presented in Table 1.

Table 1. Accuracy of learning theory identification

Case	Correct Groups	Percentage
Case A	4	100%
Case B	3	75%
Case C	2	50%
Case D	2	50%

Table 1 shows the number of groups that correctly identified the dominant learning theory in each instructional case. All groups correctly identified the theory represented in Case A. Three groups correctly identified the theory in Case B. In Cases C and D, two groups correctly identified the dominant theory represented in the instructional scenario.

### *Distribution of Identified Learning Theories*

The learning theories identified by the student groups in each case are summarized in Table 2.

Table 2. Distribution of theories identified by student groups

Case	Piaget	Bruner	Ausubel	Gagné	Other
Case A	4	0	0	0	0
Case B	0	3	0	0	1
Case C	0	0	2	1	1
Case D	0	0	0	2	2

Table 2 presents the distribution of theories selected by the groups when analyzing the instructional cases. All groups associated Case A with Piaget's theory. In Case B, most groups selected Bruner's theory, while one group selected a different theory. In Case C, two groups identified Ausubel's theory, while other responses referred to different theoretical perspectives. In Case D, two groups identified Gagné's theory, while two groups associated the case with other theories.

### *Students' Written Reasoning in Case Analysis*

Students provided written explanations to justify their identification of learning theories in each case. The responses contained references to several theoretical concepts. In Case A, students frequently referred to the concept of assimilation and misconceptions when explaining the situation. One group stated that students already had their own understanding of force and therefore maintained their initial concept even after the teacher explained. In Case B, several groups emphasized the role of experimentation and pattern recognition when identifying the learning theory. One group explained that students conducted experiments and discovered the relationship between force and acceleration through their own investigation.

In Case C, students referred to the use of concept maps and the explanation of general conceptual relationships at the beginning of instruction. Some responses mentioned the connection between new knowledge and prior knowledge as evidence in the case. In Case D, the written responses frequently referred to problem-solving activities involving the identification of forces, the construction of force diagrams, and the combination of several concepts to solve a contextual problem. The written responses also showed variation in the level of explanation provided by the groups. Some groups used explicit theoretical terminology when explaining their answers, while other groups described instructional activities without directly referring to specific theoretical concepts.

## DISCUSSION

The instructional cases used in this study were intentionally designed to represent different cognitive learning theories commonly discussed in teacher education. Case A illustrated a misconception related to Newton's law reflecting Piaget's concept of assimilation. Case B represented

discovery learning through experimental investigation. Case C involved the use of concept mapping corresponding to Ausubel's advanced organizer, while Case D presented a complex problem-solving situation aligned with Gagné's hierarchical learning processes. The findings of this study reveal varying levels of students' ability to identify cognitive learning theories when analysing instructional cases. All groups successfully identified the theoretical perspective underlying the misconception case, and most groups correctly recognized the discovery-learning situation. However, accuracy decreased in cases involving instructional organization and hierarchical problem solving. These results suggest that prospective teachers recognize learning theories more easily when instructional situations contain clearly observable learning activities, such as conceptual conflict or experimental exploration, whereas theories related to instructional structuring and cognitive organization appear to be less readily identifiable.

The high accuracy observed in the misconception case may be related to the strong emphasis on conceptual conflict in science education. Research on students' misconceptions shows that learners often maintain prior conceptions even after receiving scientific explanations, reflecting the cognitive processes of assimilation and accommodation described in Piagetian theory (Bormanaki & Khoshhal, 2017; Yilmaz, 2011). Because conceptual change and alternative conceptions are widely discussed in physics education (Eshetu & Alemu, 2018; Fratiwi et al., 2020; Ozkan & Sezgin Selcuk, 2015; Suhandi et al., 2025; Susilowati et al., 2025), prospective teachers may already be familiar with learning situations that involve conflicts between prior knowledge and new information. Consequently, when instructional scenarios clearly illustrate a student maintaining an incorrect belief despite explanation, the theoretical perspective associated with conceptual conflict becomes easier for students to recognize. This finding indicates that theories associated with observable learning phenomena, such as misconceptions and conceptual conflict, tend to be more readily identified because the underlying cognitive processes are clearly reflected in the instructional situation.

In addition to the misconception case, most groups were also able to identify the discovery learning situation. This finding suggests that students are relatively familiar with instructional contexts that emphasize exploration and experimentation. Discovery learning highlights the role of active exploration and inductive reasoning, in which learners construct understanding by identifying patterns and relationships from their experiences rather than receiving direct explanations (Faoziyah et al., 2024). In science education, experimental activities frequently require students to observe patterns and formulate relationships among variables, which may make the characteristics of discovery learning more visible. Previous studies have also shown that interactive and exploratory learning environments, including game-based activities, can promote deeper conceptual engagement and encourage active participation in the learning process (Adipat et al., 2021; Ke et al., 2016; Zahran et al., 2025). Because the experimental activity in Case B explicitly required students to investigate relationships between variables, the theoretical features associated with discovery learning became easier for students to recognize.

In contrast, the lower accuracy observed in the cases related to instructional organization and structured problem solving suggests that prospective teachers may experience greater difficulty distinguishing among certain cognitive learning theories when the instructional features are less explicit. For instance, several groups did not associate the concept-mapping activity with Ausubel's theory of meaningful learning, even though advance organizers are designed to help learners integrate new information into existing cognitive structures. According to Ausubel, meaningful learning occurs when new knowledge is systematically connected with prior knowledge through conceptual organization (Agra et al., 2019; Ausubel, 2000; Ciechanowska, 2018). Similarly, in the problem-solving case, some students associated the activity with other theoretical perspectives rather than recognizing the hierarchical integration of concepts emphasized in Gagné's learning hierarchy. Gagné proposed that complex problem solving requires the integration of previously learned concepts and principles through structured cognitive processes (Gagné, 2013; Salemian et al., 2020), which may be less immediately visible to students compared with more explicit instructional activities such as experimentation. This pattern indicates that prospective teachers may rely on surface instructional features when interpreting learning situations rather than analysing the underlying cognitive processes represented in the instructional design.

These findings highlight the potential role of interactive case-based learning activities in supporting students' ability to connect theoretical knowledge with classroom practices. Through the

rotating case analysis activity, students were required to examine multiple instructional scenarios, discuss their interpretations with peers, and justify their theoretical explanations. Such activities may encourage prospective teachers to analyse instructional situations more critically and to apply theoretical perspectives when interpreting classroom practices. Game-based learning environments have also been shown to increase engagement and support collaborative reasoning during learning activities, particularly when students are required to interpret complex scenarios and discuss alternative explanations (Katual et al., 2023; Ke et al., 2016). In this context, the CAGeR activity provided a structured opportunity for students to examine instructional situations from multiple theoretical perspectives, thereby strengthening the connection between theoretical knowledge and classroom interpretation.

Overall, the findings suggest that prospective teachers are more likely to recognize learning theories when instructional situations explicitly involve conceptual conflict or discovery-based activities, while theories related to instructional organization and hierarchical problem solving appear to be more difficult to identify. This pattern indicates the importance of providing learning experiences that explicitly encourage students to interpret teaching situations through theoretical frameworks. By integrating case analysis with interactive learning activities, teacher education programs may help prospective teachers strengthen their ability to connect educational theory with classroom practice. Furthermore, repeated exposure to structured case analysis activities may support prospective teachers in developing a deeper ability to distinguish among different learning theories when interpreting instructional situations.

Despite these contributions, several limitations should be considered. The study involved a relatively small number of participants from a single course in one university, which limits the generalizability of the findings to broader contexts. In addition, the analysis focused on group responses rather than individual reasoning processes, which may conceal variations in individual understanding. Future research may examine how structured scaffolding or repeated case-based learning activities support prospective teachers in identifying theoretical perspectives more accurately. Studies involving larger samples, repeated instructional sessions, and individual assessments may provide deeper insights into how students' ability to interpret learning theories develops over time.

## CONCLUSION

This study concludes that undergraduate students were generally able to identify cognitive learning theories when analysing instructional cases through the Case Analysis Game with Rotation (CAGeR). Students showed the highest accuracy in recognizing theories associated with conceptual conflict and discovery-based learning, particularly in cases reflecting Piagetian perspectives and Bruner's discovery learning. However, their ability to identify theories related to instructional organization and hierarchical problem solving, such as those represented in Ausubel's meaningful learning and Gagné's learning hierarchy, was comparatively lower. The use of rotating case analysis activities provided opportunities for students to collaboratively analyse authentic teaching situations and connect theoretical concepts with classroom practice. Therefore, integrating interactive case-based game activities such as CAGeR in teacher education may support prospective teachers in strengthening their ability to interpret instructional practices through theoretical frameworks.

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