

# Relationship of the Perceptions of the Game-Based Learning Tools in Computational Thinking Skills of Grade 7 Learners in Physics

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## ABSTRACT

This study examined the relationship between game-based learning tools and the computational thinking skills of Grade 7 learners in Physics at Pantay Integrated High School. It focused on the learners' perceptions of game-based learning tools in terms of engagement, motivation, and positive attitudes, as well as their computational thinking skills in analysis, abstraction, algorithmic thinking, and pattern recognition. The study used a quantitative correlational research design. The sample size of 126 Grade 7 students was determined using the Raosoft Formula, and the respondents were selected through stratified random sampling to ensure proper representation of the different sections. The results showed that game-based learning tools help improve students' computational thinking skills, especially in problem-solving, logical reasoning, and algorithmic thinking. Based on the findings, the study recommends that Physics teachers may use more game-based learning activities in class and that the school provide enough digital resources and training to support effective teaching strategies in Physics.

**Keywords:** Game-Based Learning Tools, Engagement, Motivation, Positive Attitudes, Computational Thinking Skills, Analysis, Pattern Recognition, Abstraction, Algorithmic Thinking, Grade 7 Learners, Physics

## INTRODUCTION

The educational system of the 21st century continues to transform due to rapid technological advancements and increasing demands for higher-order thinking skills. Educational systems worldwide now prioritize computational thinking as a fundamental skill that students must develop through Science, Technology, Engineering, and Mathematics (STEM) education. Learners who acquire computational thinking are able to solve problems systematically, apply logical reasoning, and develop effective solutions, making it essential in understanding complex subjects like Physics (Tang et al., 2020). UNESCO also emphasizes the integration of digital technologies and innovative teaching approaches to equip students with the necessary 21st-century skills (UNESCO, 2021).

Computational thinking skills include analysis, pattern recognition, abstraction, and algorithmic thinking, which together help learners break down complex problems, identify patterns, focus on essential information, and develop step-by-step solutions for effective problem-solving (Shute et al., 2021).

In the Philippines, the Department of Education (DepEd) implements the K–12 Basic Education Curriculum to develop essential competencies aligned with global standards. The curriculum promotes learner-centered and technology-based teaching approaches. One of these approaches is game-based learning, which creates an interactive learning environment using elements such as rules, challenges, and feedback. This method has been shown to improve student engagement and enhance learning experiences (Clark et al., 2020), as well as increase motivation and academic performance (Tokac et al., 2021).

Game-based learning tools refer to instructional materials that integrate game elements such as points, challenges, rewards, and levels to make learning more engaging and interactive, while at the same time

supporting students’ understanding of academic concepts and improving their motivation and participation in the learning process (Clark et al., 2020).

Despite these advancements, the teaching and learning of Physics still present challenges, particularly among Grade 7 students. Physics concepts are often abstract, making them difficult to understand, which results in low interest and poor academic performance (OECD, 2020). Traditional teaching methods may not effectively support the development of computational thinking skills. As a result, students struggle with problem-solving, logical reasoning, and applying concepts to real-life situations.

These challenges in understanding Physics concepts and low classroom participation motivated the researcher to conduct this study. With the growing availability of digital tools, game-based learning offers a modern approach to teaching. It allows students to engage in interactive activities that can enhance their computational thinking skills. Studies show that game-based environments help develop essential skills such as problem-solving, abstraction, and algorithmic thinking (Román-González et al., 2020).

In the Philippine context, there is also a lack of localized studies examining how Grade 7 students use game-based learning tools to develop computational thinking skills. Addressing this gap is important in improving teaching practices based on local educational needs. According to Pan et al. (2024), game-based learning environments support computational thinking skill development through activities which require students to solve problems and practice logical reasoning and take part in interactive learning activities. Ma et al. (2023) showed that game-based teaching methods help students develop advanced thinking abilities while increasing their academic participation.

This study focuses on how game-based learning and computational thinking influence students’ understanding of scientific concepts. The main purpose of this study is to provide evidence on how game-based learning tools affect the computational thinking skills of Grade 7 students in Physics at Pantay Integrated High School. The findings aim to contribute to the development of more engaging and effective teaching strategies. Ultimately, the research seeks to help students develop skills necessary for lifelong learning and real-world problem-solving.

## RESEARCH METHODS

This study will utilize a quantitative correlational research design to determine the relationship between the use of game-based learning tools and the computational thinking skills of Grade 7 learners in Physics. A correlational approach is appropriate because it examines whether a significant relationship exists between variables without manipulating them. The study focuses on identifying how game-based learning tools relate to learners’ ability to think computationally.

## RESULTS AND DISCUSSION

This chapter presents the analysis and interpretation of the data about the problems addressed in this study.

### On the perception of Grade 7 learners on the game-based learning tools in terms of:

#### Engagement

**Table 1.1 Perceptions of Grade 7 learners on the game-based learning tools in terms of Engagement**

Indicators	Weighted Mean	SD	Verbal Interpretation
1. I pay close attention during Physics lessons when game-based tools are used.	3.23	0.61	Agree
2. I actively participate when I use games in our Physics class.	3.24	0.67	Agree
3. I feel involved in the lesson when game-based learning is used.	3.30	0.58	Strongly Agree

4. I focus more on the topic when learning through games.	3.16	0.71	Agree
5. I enjoy completing Physics activities that use game elements.	3.38	0.61	Strongly Agree
6. I try my best to finish game-based tasks in Physics.	3.42	0.58	Strongly Agree
7. I remain interested throughout the lesson when games are used.	3.16	0.61	Agree
8. I interact more with my classmates during game-based activities.	3.23	0.66	Agree
9. I become very focused when participating in game-based lessons.	3.26	0.62	Strongly Agree
10. I look forward to Physics class when game-based learning is used.	3.24	0.60	Agree
<b>Overall Result</b>	<b>3.27</b>	<b>0.63</b>	<b>Strongly Agree</b>

Legend: Strongly Agree 3.26-4.00; Agree 2.51-3.25; Disagree 1.76-2.50; Strongly Disagree 1.00-1.75

Firstly, respondents demonstrated a strong level of perception regarding their engagement in game-based Physics lessons, with an overall mean score of 3.27 interpreted as “Strongly Agree.” This indicates that incorporating game elements in Physics lessons makes learners more engaged and interested in class activities. Among the indicators, the highest mean score was obtained from the statement “I try my best to finish game-based tasks in Physics,” with a mean of 3.42, also interpreted as “Strongly Agree.” This implies that learners are highly motivated and willing to exert effort in completing Physics tasks when these are presented in a game-based format, as the activities become more enjoyable and stimulating for them.

On the other hand, the lowest mean was observed in the indicator “I remain interested throughout the lesson when games are used,” which obtained a mean score of 3.16, interpreted as “Agree.” This suggests that although learners generally find game-based lessons engaging, their sustained interest throughout the entire discussion may still vary depending on factors such as the design of the game, its level of difficulty, pacing, and how well it is integrated into the lesson flow. It implies that while games are effective in capturing initial attention and boosting motivation, maintaining consistent engagement until the end of the lesson requires well-structured and carefully facilitated activities that keep learners continuously involved.

According to Bond et al. (2020), student engagement increases when learners participate in meaningful and interactive activities. Likewise, Hamari et al. (2016) found that game-based environments enhance engagement by providing clear objectives, real-time feedback, and enjoyable learning experiences.

## Motivation

**Table 1.2 Perceptions of Grade 7 learners on the game-based learning tools in terms of Motivation**

Indicators	Weighted Mean	SD	Verbal Interpretation
1. I feel motivated to learn more about Physics through game-based learning.	3.38	0.59	Strongly Agree
2. I feel excited when our lesson includes learning games.	3.47	0.58	Strongly Agree
3. I try harder in Physics when games are used.	3.07	0.64	Agree
4. I am encouraged to improve my performance when game-based learning is used.	3.34	0.59	Strongly Agree
5. I feel challenged to do better when using game-based tools.	3.14	0.64	Agree
6. I am motivated to finish Physics tasks when they are presented as games.	3.34	0.62	Strongly Agree

7. I want to participate more when learning involves games.	3.34	0.66	Strongly Agree
8. I find game-based learning makes Physics more interesting for me.	3.33	0.60	Strongly Agree
9. I feel proud when I succeed in Physics learning games.	3.42	0.63	Strongly Agree
10. I study Physics more because of game-based activities.	3.12	0.64	Agree
<b>Overall Result</b>	<b>3.30</b>	<b>0.62</b>	<b>Strongly Agree</b>

Legend: Strongly Agree 3.26-4.00; Agree 2.51-3.25; Disagree 1.76-2.50; Strongly Disagree 1.00-1.75

In Table 1.2, the findings show that learners strongly agree that game-based learning improves their motivation, with an overall mean of 3.30. This indicates that students feel more encouraged, excited, and willing to participate in Physics when games are used. This supports the study of Rajendran et al. (2025), which stated that game-based learning increases students' motivation by providing enjoyable and interactive learning experiences. Similarly, Ryan and Deci (2020) explained that learners become more motivated when activities provide challenges, feedback, and active participation opportunities.

The indicator with the highest mean is "I feel excited when our lesson includes learning games." with a weighted mean of 3.47, verbally interpreted as Strongly Agree. This shows that learners become more enthusiastic when games are integrated into Physics lessons. This finding is supported by Hwang et al. (2019), who found that students become more motivated when learning tasks are presented as enjoyable challenges.

On the other hand, the indicator with the lowest mean is "I try harder in Physics when games are used," with a weighted mean of 3.07, verbally interpreted as Agree. This suggests that while game-based learning is effective in increasing learners' interest and motivation, it does not always automatically translate into greater effort for all students. Some learners may still participate passively or rely mainly on the enjoyment aspect of the activity rather than pushing themselves to perform better academically. This implies that motivation triggered by games may sometimes remain at an extrinsic or situational level, where students are engaged but not consistently exerting maximum effort in challenging tasks. Therefore, teachers may need to provide clear goals, rewards tied to learning outcomes, and guided reflection activities to help students connect enjoyment with sustained effort in Physics tasks.

This suggests that although learners are motivated by games, some students still need additional encouragement to exert more effort in Physics tasks. Howard et al. (2021) explained that some learners still require guidance and support to sustain effort and develop self-directed learning habits.

### Positive Attitudes

**Table 1.3 Perceptions of Grade 7 learners on the game-based learning tools in terms of Positive Attitudes**

Indicators	Weighted Mean	SD	Verbal Interpretation
1. I like learning Physics through game-based tools.	3.30	0.61	Strongly Agree
2. I feel that Physics becomes more enjoyable when using game-based learning.	3.42	0.58	Strongly Agree
3. I feel confident when answering Physics questions in games.	3.04	0.61	Agree
4. I believe game-based learning is helpful in understanding Physics.	3.31	0.62	Strongly Agree
5. I feel less stressed when learning Physics through games.	3.01	0.73	Agree
6. I think using games is a good way to learn Physics.	3.33	0.66	Strongly Agree
7. I feel happy when our teacher uses game-based activities.	3.45	0.56	Strongly Agree

8. I prefer game-based activities over traditional lectures.	3.09	0.69	Agree
9. I believe game-based learning improves my understanding of Physics concepts.	3.30	0.66	Strongly Agree
10. I would recommend using game-based learning in other subjects.	3.28	0.72	Strongly Agree
<b>Overall Result</b>	<b>3.26</b>	<b>0.65</b>	<b>Strongly Agree</b>

Legend: Strongly Agree 3.26-4.00; Agree 2.51-3.25; Disagree 1.76-2.50; Strongly Disagree 1.00-1.75

In table 1.3, the results reveal that learners have strongly positive attitudes toward game-based learning, with an overall mean of 3.26. This indicates that students enjoy learning Physics through games and perceive it as less stressful and more effective.

The indicator with the highest mean is “I feel happy when our teacher uses game-based activities.” with a weighted mean of 3.45, verbally interpreted as Strongly Agree. This shows that learners develop positive emotions and enjoyment whenever game-based learning is used in class. The use of games may create a more relaxed and enjoyable learning environment for students.

Meanwhile, the indicator with the lowest mean is “I feel less stressed when learning Physics through games.” with a weighted mean of 3.01, verbally interpreted as Agree. This implies that while games help improve students’ attitudes toward Physics, some learners may still experience stress or difficulty in understanding certain lessons and activities.

This implies that game-based learning creates an atmosphere for positive learning experiences where learners feel confident and comfortable. Positive attitudes toward learning help improve students’ understanding and academic performance. This finding is supported by Turan and Meral (2018), who explained that game-based learning makes lessons more enjoyable and less stressful for learners.

### On the Level of Grade 7 Learners Computational Thinking Skills Analysis

**Table 2.1 Level of Grade 7 learners computational thinking skills in terms of Analysis**

Indicators	Weighted Mean	SD	Verbal Interpretation
1. I can break a big problem in Physics into smaller parts.	2.76	0.73	High
2. I separate difficult questions into steps to understand them better.	3.26	0.62	Very High
3. I identify the main parts of a problem before solving it.	3.42	0.61	Very High
4. I divide a task into simple steps when answering Physics activities.	3.26	0.62	Very High
5. I look at one part of the problem at a time.	3.18	0.63	High
6. I can organize information into simpler parts to make it easier to understand.	3.34	0.67	Very High
7. I solve one small part first before finishing the whole problem.	3.23	0.60	High
8. I list the important details before answering a question.	3.44	0.57	Very High
9. I focus on one part of a lesson at a time to understand the whole topic.	3.44	0.58	Very High
10. I break down instructions into parts before doing an activity.	3.03	0.74	High
<b>Overall Result</b>	<b>3.24</b>	<b>0.64</b>	<b>High</b>

Legend: Strongly Agree/Very High 3.26-4.00; Agree/High 2.51-3.25; Disagree/Moderate 1.76-2.50; Strongly Disagree/Low 1.00-1.75

Table 2.1 shows that Grade 7 learners have a high level of analytical skills, with an overall mean of 3.24, verbally interpreted as High. This indicates that learners are capable of breaking down problems into smaller and more manageable parts to better understand Physics concepts.

The indicators with the highest weighted mean are “I list the important details before answering a question” and “I focus on one part of a lesson at a time to understand the whole topic,” both obtaining 3.44, verbally interpreted as Very High. This suggests that learners can organize information and concentrate on important details, which support problem-solving and understanding of scientific concepts.

Meanwhile, the indicator “I can break a big problem in Physics into smaller parts” obtained the lowest weighted mean of 2.76, interpreted as High. This implies that some learners still experience difficulty in decomposing complex Physics problems.

These findings suggest that learners possess analytical abilities essential in computational thinking. This supports the study of Shute et al. (2017), which explained that analysis is an important component of computational thinking because learners examine information carefully before solving problems. Likewise, Weintrop et al. (2016) stated that analytical thinking enables students to understand scientific relationships rather than rely solely on memorization.

### Abstraction

**Table 2.2 Level of Grade 7 learners computational thinking skills in terms of Abstraction**

Indicators	Weighted Mean	SD	Verbal Interpretation
1. I focus on the important details when solving a problem.	3.53	0.56	Very High
2. I identify the important information when studying a lesson.	3.51	0.50	Very High
3. I can identify the main idea in a topic.	3.20	0.63	High
4. I understand a concept even without seeing many examples.	2.80	0.76	High
5. I summarize information in my own words.	3.10	0.81	High
6. I can separate important and unimportant details.	3.23	0.72	High
7. I think about the key parts of a problem before answering.	3.29	0.62	Very High
8. I use simple ideas to understand complex topics.	3.38	0.59	Very High
9. I can explain a lesson using basic terms.	3.12	0.69	High
10. I focus on the essential information when doing activities in Physics.	3.38	0.52	Very High
<b>Overall Result</b>	<b>3.26</b>	<b>0.64</b>	Very High

Legend: Strongly Agree/Very High 3.26-4.00; Agree/High 2.51-3.25; Disagree/Moderate 1.76-2.50; Strongly Disagree/Low 1.00-1.75

Table 2.2 reveals that learners demonstrated a high level of abstraction skills. This indicates that students are generally capable of identifying essential information and focusing on important concepts while solving Physics problems.

The highest indicator is “I focus on important details when solving a problem” with a weighted mean of 3.53, interpreted as Very High. This suggests that learners can distinguish relevant information necessary for understanding lessons.

The lowest indicator is “I understand a concept even without seeing many examples” with a weighted mean of 2.80, interpreted as High. This implies that some learners still need additional examples to understand abstract concepts.

The findings support Wing (2017), who emphasized that abstraction enables learners to remove unnecessary details and focus on important information. Similarly, Pan et al. (2024) explained that game-based activities help students practice abstraction through structured problem-solving tasks.

### Algorithmic Thinking

**Table 2.3 level of Grade 7 learners computational thinking skills in terms of Algorithmic Thinking**

Indicators	Weighted Mean	SD	Verbal Interpretation
1. I can follow directions in the correct order.	3.50	0.57	Very High
2. I can arrange steps properly when solving problems.	3.34	0.61	Very High
3. I can create a simple plan before doing an activity.	3.30	0.65	Very High
4. I can use procedures to answer questions.	3.27	0.57	Very High
5. I can complete tasks by following instructions.	3.42	0.62	Very High
6. I can think of step-by-step solutions when solving problems.	3.32	0.61	Very High
7. I can check my work after following steps.	3.35	0.62	Very High
8. I can solve problems using an organized method.	3.25	0.69	High
9. I understand the importance of order in solving problems.	3.23	0.67	High
10. I can arrange the steps in the correct order when solving a problem.	3.25	0.73	High
<b>Overall Result</b>	<b>3.33</b>	<b>0.64</b>	<b>Very High</b>

Legend: Strongly Agree/Very High 3.26-4.00; Agree/High 2.51-3.25; Disagree/Moderate 1.76-2.50; Strongly Disagree/Low 1.00-1.75

In table 2.3 shows the results reveal that demonstrated a very high level of algorithmic thinking skills, with an overall mean of 3.33. This indicates that students can follow procedures and solve problems step-by-step.

The indicator with the highest mean is “I can follow directions in the correct order” with a weighted mean of 3.50, verbally interpreted as Strongly Agree. This indicates that learners are capable of following procedures and instructions systematically when solving Physics-related tasks. It reflects their ability to think step-by-step in completing activities.

On the other hand, the indicator with the lowest mean is “I understand the importance of order in solving problems” with a weighted mean of 3.23, verbally interpreted as Agree. This suggests that although learners can follow instructions, some students may still need further improvement in recognizing the importance of proper sequencing when solving problems.

The findings indicate that learners possess algorithmic thinking skills necessary for solving problems systematically. Learners can follow organized steps and procedures in answering Physics-related activities. This supports Shute et al. (2017), who explained that algorithmic thinking involves creating logical sequences to solve problems effectively. Likewise, Román-González et al. (2017) stated that interactive learning activities strengthen learners' ability to think procedurally and generate structured solutions.

### Pattern Recognition

**Table 2.4 Level of Grade 7 learners computational thinking skills in terms of Pattern Recognition**

Indicators	Weighted Mean	SD	Verbal Interpretation
1. I identify patterns in problems before solving them.	3.35	0.54	Very High
2. I look for similarities when solving Physics questions.	3.34	0.56	Very High
3. I notice repeated information in a problem.	3.29	0.60	Very High
4. I compare examples to find patterns that help me understand how a problem works.	3.37	0.64	Very High
5. I identify patterns that help me find the correct answer.	3.39	0.56	Very High
6. I use patterns to help me solve problems.	3.38	0.56	Very High
7. I observe common steps in different problems and apply them to similar problems.	3.30	0.64	Very High
8. I find similarities between new and previous lessons to make it easier for me to understand and solve new problems.	3.34	0.57	Very High
9. I pay attention to repeated numbers or results.	3.24	0.57	High
10. I use patterns to understand solutions better.	3.36	0.67	Very High
<b>Overall Result</b>	<b>3.34</b>	<b>0.60</b>	<b>Very High</b>

Legend: Strongly Agree/Very High 3.26-4.00; Agree/High 2.51-3.25; Disagree/Moderate 1.76-2.50; Strongly Disagree/Low 1.00-1.75

In table 2.4, the results show that learners demonstrated a very high level of pattern recognition skills, with an overall mean of 3.34. This indicates that students can identify similarities and patterns in problems.

In Table 2.4, the indicator with the highest mean is “I identify patterns that help me find the correct answer” with a weighted mean of 3.39, verbally interpreted as Strongly Agree. This indicates that learners are able to recognize patterns and use them effectively in solving Physics problems. Recognizing similarities and repeated concepts may help students understand lessons more efficiently.

Meanwhile, the indicator with the lowest mean is “I pay attention to repeated numbers or results” with a weighted mean of 3.24, verbally interpreted as Agree. This suggests that some learners may still need improvement in observing repeated numerical patterns and results when answering Physics problems.

It can therefore be inferred that students have an ability to relate previous experiences to new settings. It may then be concluded that the students are capable of relating their past experience to new learning experiences. As indicated by Wing (2017), the process of recognizing patterns will help the learner to detect similarities and recurring structures, making problem-solving much simpler. Korkmaz et al. (2017) stated that recognizing patterns makes the learner more capable of utilizing past knowledge in new problems.

### 3. Significant relationship between the game-based learning tools and the computational thinking skills of Grade 7 learners

**Table 3.1 Significant relationship between the game-based learning tools and the computational thinking skills of Grade 7 learners in terms of Analysis**

Game-based Learning Tools	r -value	Sig. (2-tailed)	Interpretation
Engagement VS. Analysis	0.646	<.001	Reject Ho, Significant
Motivation VS. Analysis	0.729	<.001	Reject Ho, Significant
Positive Attitudes VS. Analysis	0.654	<.001	Reject Ho, Significant

Table 3.1 show that there is a significant relationship between game based learning tools and the computational thinking skill of analysis, as evidenced by the r-values ranging from 0.646 to 0.729 and a significance level of  $p < .001$ . This indicates a moderate to strong positive correlation, meaning that as learners' engagement, motivation, and positive attitudes toward game-based learning increase, their ability to analyze problems also improves.

Among the variables, motivation ( $r = 0.729$ ) shows the strongest relationship with analysis, suggesting that motivated learners are more likely to break down complex Physics problems into manageable parts.

The findings indicate a significant positive relationship between game-based learning tools and analytical skills. This suggests that learners who experience higher engagement through game-based activities tend to develop stronger analytical abilities. These findings support Pan et al. (2024), who found that game-based environments improve problem-solving and structured thinking. Similarly, Qian and Clark (2016) explained that educational games encourage strategic thinking and cognitive development.

**Table 3.2 Significant relationship between the game-based learning tools and the computational thinking skills of Grade 7 learners in terms of Abstraction**

Game-based Learning Tools	r -value	Sig. (2-tailed)	Interpretation
Engagement VS. Abstraction	0.625	<.001	Reject Ho, Significant
Motivation VS. Abstraction	0.613	<.001	Reject Ho, Significant
Positive Attitudes VS. Abstraction	0.611	<.001	Reject Ho, Significant

Table 3.2 shows a significant relationship between game-based learning tools and abstraction, with r-values ranging from 0.611 to 0.625 and  $p < .001$ . These results indicate a moderate positive correlation, suggesting that game-based learning helps learners focus on essential information and ignore irrelevant details.

Among the variables, engagement ( $r = 0.625$ ) shows the highest correlation, indicating that active participation supports learners' ability to identify key ideas. This aligns well with findings indicating that game-based learning aids in facilitating the abilities of concept simplification and abstraction.

The findings support Wing (2017), who emphasized that abstraction enables learners to focus on important information while removing unnecessary details. Similarly, Pan et al. (2024) explained that game-based learning activities help students develop abstraction skills through structured and interactive problem-solving experiences.

**Table 3.3 Significant relationship between the game-based learning tools and the computational thinking skills of Grade 7 learners in terms of Algorithmic Thinking**

Game-based Learning Tools	r -value	Sig. (2-tailed)	Interpretation
Engagement VS. Algorithmic Thinking	0.617	<.001	Reject Ho, Significant

Motivation VS. Algorithmic Thinking	0.624	<.001	Reject Ho, Significant
Positive Attitudes VS. Algorithmic Thinking	0.592	<.001	Reject Ho, Significant

Table 3.3 show that there is a significant relationship between game-based learning tools and algorithmic thinking, with r-values ranging from 0.592 to 0.624 and  $p < .001$  . This indicates a moderate positive correlation, meaning that learners exposed to game-based learning are more likely to develop step-by-step problem-solving skills.

Motivation ( $r = 0.624$ ) shows the strongest relationship, suggesting that motivated learners are more inclined to follow structured procedures.

The findings support Shute et al. (2017), who explained that algorithmic thinking involves creating logical sequences to solve problems effectively. Likewise, Román-González et al. (2017) stated that interactive learning activities strengthen learners’ ability to think procedurally and generate structured solutions.

**Table 3.4 Significant relationship between the game-based learning tools and the computational thinking skills of Grade 7 learners in terms of Pattern Recognition**

Game-based Learning Tools	r -value	Sig. (2-tailed)	Interpretation
Engagement VS. Pattern Recognition	0.690	<.001	Reject Ho, Significant
Motivation VS. Pattern Recognition	0.647	<.001	Reject Ho, Significant
Positive Attitudes VS. Pattern Recognition	0.549	<.001	Reject Ho, Significant

Table 3.4 indicates a significant relationship between game-based learning tools and pattern recognition, with r-values ranging from 0.549 to 0.690 and  $p < .001$ . This reflects a moderate to strong positive correlation, showing that game-based learning helps learners identify similarities, trends, and repeated structures in problems.

Among the variables, engagement ( $r = 0.690$ ) has the strongest relationship, suggesting that actively engaged learners are more capable of recognizing patterns.

The findings support Wing (2017), who explained that recognizing patterns enables learners to identify similarities and recurring structures which make problem-solving easier. Likewise, Pan et al. (2024) found that game-based learning activities improve students’ ability to identify patterns and apply prior knowledge in unfamiliar contexts.

## SUMMARY OF FINDINGS

The salient findings of the study are summarized as follows:

Learners had very positive perceptions towards game-based learning tools in terms of their engagement, motivation, and positive attitudes. They were highly participative, interested, and enjoying the lessons where game-based teaching approaches were utilized in Physics classes.

Learners showed a high level of computational thinking skills in terms of their analytical ability, abstraction, algorithmic thinking, and pattern recognition. This means that the learners have the capacity to break down problems into smaller parts, identify vital information, follow processes, and recognize patterns.

There exists a significant association between game-based learning tools and computational thinking skills. Engagement, motivation, and positive attitudes were positively related to learners' ability to analyze problems, abstract important information, engage in algorithmic thinking, and recognize patterns.

## CONCLUSION

The study confirms the existence of a significant relationship between the game-based learning tool and

computational thinking skills, meaning that using game-based learning approach plays a key role in fostering higher-order thinking skills among learners. Game-based learning is therefore an effective teaching strategy in enhancing learners' understanding of Physics and higher-order thinking skills.

## RECOMMENDATIONS

In light of the findings and conclusion of the study, the following recommendations are offered:

1. Teachers are encouraged to adopt game-based learning methodologies while conducting Physics classes in order to enhance the level of students' motivation and computational thinking. In addition, they are required to make activities that encourage higher-level thinking.
2. The students are encouraged to be active participants in the gaming process of learning to enhance their problem-solving and computational skills necessary for learning the subject Physics.
3. The school administrator is encouraged to facilitate the adoption of game-based learning tools by making available various resources and technological assistance to improve the efficiency of instructional methodologies and increase student learning outcomes.
4. The parents should assist the children in learning the concepts by ensuring that they learn through the process of educational games.
5. Future researchers can be undertaken by other scholars who can investigate the use of game-based learning methods in other areas or grade levels to validate the results obtained from this study.
6. It is recommended to use interactive physics games such as PhET simulation activities where learners explore concepts through experiments, challenges, and problem-solving tasks. These activities help improve computational thinking skills by developing logical reasoning, analysis, and decision-making in an engaging learning environment.

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