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Hots Learning Package Based on Solo Framework in Improving Students' Cognitive Development and Performance in Science

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Abstract— *This study developed and validated a High-Order Thinking Skills (HOTS) Learning Package based on the Structure of the Observed Learning Outcome (SOLO) Framework in improving Students' Cognitive Development and Performance in Science. This research explored the perceived level of the HOTS Learning Package components and features. It also examined the level of students' cognitive development and performance in science. Then, it analyzed the significant relationship between the utilization of the HOTS Learning Package and students' cognitive development, as well as the significant effect of the learning package to students' performance. A correlational research design was employed. Quantitative data were collected from 120 purposively selected Grade 9 students of Pedro Guevara Memorial National High School using survey questionnaires, written task, and performance task. Findings revealed that the HOTS Learning Package was perceived at a Very High level for both its components and features. It was also found that the cognitive development among students reached a Very High level across all indicators. Moreover, students demonstrated a Very Satisfactory level in the written task and an Outstanding level in the performance task. Further analysis confirmed a significant relationship between the utilization of the HOTS Learning Package and students' cognitive development. On the other hand, the study found that only the features of the learning package had a significant effect on students' performance, whereas its components showed no significant effect. The study established that there is a significant relationship between the utilization of the HOTS Learning Package based on the SOLO Framework and students' cognitive development. Thus, the posited null hypothesis is rejected. This concludes that HOTS Learning Package effectively supports students' cognitive development. Moreover, HOTS Learning Package components have no significant effect while its features have significant effect on students' performance. Therefore, the null hypothesis is partially rejected. This means that while components provide structure, it is the features that actively drive improvements in students' performance. In light of the results, it is recommended that science teachers integrate the HOTS learning package based on the SOLO Framework into their teaching. Future versions should maintain and enhance its features. Researchers are advised to explore its effectiveness across various educational contexts.*

Keywords— *HOTS, SOLO, Cognitive Development, Performance, Science .*

I. INTRODUCTION

The Structure of Observed Learning Outcome (SOLO) framework offers a model for evaluating students' learning outcomes, categorizing their understanding from simple to complex levels. It provides a systematic method for assessing the quality of learners' responses and promotes deeper understanding. This aligns with the goal of Higher-Order Thinking Skills (HOTS), which encourages students to go beyond basic recall and engage in more advanced cognitive processes, such as analysis, evaluation, and creation.

In this study, the SOLO framework served as a pathway for fostering HOTS by providing a structured progression from basic to complex understanding in the form of HOTS Learning Package.

The HOTS Learning Package was specifically developed and validated to improve students' cognitive development and performance in science.

Cognitive development is crucial because it reflects how well students can process information and solve complex problems. As students progress through various levels of understanding, they demonstrate increasingly complex cognitive abilities. This development is vital in science education, where students are expected not only to remember concepts but also to explain phenomena, make predictions, and design investigations based on scientific principles. This study examined cognitive development through the SOLO framework, which evaluates how students' thinking evolves from surface-level understanding (pre-structural and unistructural) to deep learning (relational and extended abstract). By designing learning experiences that intentionally move students through these levels, the HOTS Learning Package aimed to support learners in constructing more integrated and transferable scientific knowledge.

On the other hand, students' performance, assessed through written task and performance task evaluated using rubrics, served as tangible indicators of students' ability to demonstrate their understanding and application of scientific concepts. Performance in science includes not only mastery of content but also the ability to communicate scientific ideas, interpret data, and carry out investigations which require higher-order thinking.

Therefore, the research was aptly titled "HOTS Learning Package based on SOLO Framework in Improving Students' Cognitive Development and Performance in Science." This study provided a picture of how students learn and perform in science when supported by a structured, research-based instructional tool in the form of HOTS Learning Package based on SOLO framework.

1.1 Statement of the Problem

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Problem/s which were addressed by the research

This study developed and validated a High-Order Thinking Skills (HOTS) Learning Package based on the Structure of the Observed Learning Outcome (SOLO) Framework in improving Students' Cognitive Development and Performance in Science. The research explored the following key questions:

1. What is the perceived level of the HOTS Learning Package component based on SOLO Framework in terms of:
   1.1 Learning Objectives;
   1.2 Instructional Content;
   1.3 Learning Activities;
   1.4 Assessment; and
   1.5 Student Reflection?
2. What is the perceived level HOTS Learning Package features based on SOLO Framework in terms of:
   2.1 Appropriateness;
   2.2 Instructional Design;
   2.3 Usability;
   2.4 Complexity; and
   2.5 Coherence?
3. What is the level of students' cognitive development while using HOTS learning Package in terms of:
   3.1 Vocabulary Development;
   3.2 Reading Comprehension;
   3.3 Knowledge Acquisition;
   3.4 Conceptual Understanding; and
   3.5 Application of Knowledge?
4. What is the level of students' performance in science terms of:
   4.1 Written Task; and
   4.2 Performance Task?
5. Is there a significant relationship between the utilization of HOTS Learning Package and Students' Cognitive Development?
6. Is there a significant effect of utilizing the HOTS Learning Package on Students' Performance in Science?

II. Methodology

A correlational research design was employed. Quantitative data were collected from 120 purposively selected Grade 9 students of Pedro Guevara Memorial National High School using survey questionnaires, written task, and performance task. A 50-item summative test and a performance task evaluated using analytic rubrics in line with the SOLO taxonomy levels were also employed, which measured changes in students' performance. In addition, a Likert-scale survey questionnaire was administered to gather students' perceptions of their cognitive development. These assessments measured the students' ability to reach higher levels of learning outcomes, including relational and extended abstract.

III. Results and Discussion

This part presented and discussed the results obtained from the analysis of the data gathered in this study. All the specific questions outlined in Chapter 1 under the Statement of the Problem were addressed, with findings supported by tables. The data reflected the significant relationship between Higher-Order Thinking Skills (HOTS) Learning Package based on Structure of Observed Learning Outcomes (SOLO) framework and students' cognitive development, as well as its effect on their performance in science.

Level of HOTS Learning Package Component based on SOLO Framework

In this study, the level of HOTS Learning Package based on SOLO Framework Components refers to Learning Objectives, Instructional Content, Learning Activities, Assessment, and Student Reflection. The following tables show the specific statements evaluated, along with the corresponding mean scores, standard deviations, remarks, and verbal interpretations as provided by the respondents.

Table 1 presents the level of the HOTS Learning Package component based on the SOLO Framework in terms of Learning Objectives, specifically evaluating how clearly the objectives are defined, how well they align with higher-order thinking skills and cognitive levels defined by the SOLO taxonomy, how effectively they guide the intended cognitive development of students, and how effectively they support deep learning, critical thinking, and independent inquiry.

TABLE 1. Level of HOTS Learning Package Component based on SOLO Framework in terms of Learning Objectives

The Learning Objectives…	Mean	SD	Remarks
…are specifically designed to foster higher-order thinking skills in science.	4.00	0.00	Strongly Agree
…effectively challenge students to progress through higher SOLO levels.	4.00	0.00	Strongly Agree
…guide students towards relational and extended abstract understanding.	4.00	0.00	Strongly Agree
…are clear and achievable, while encouraging deep analysis and synthesis.	4.00	0.00	Strongly Agree
…align with fostering critical thinking and independent inquiry.	4.00	0.00	Strongly Agree
Weighted Mean	4.00		
SD	0.00		
Verbal Interpretation	Very High		

Table 1 shows that the learning objectives of the HOTS Learning Package rated as Very High in supporting advanced cognitive skills, with the computed weighted mean of 4.00 and a standard deviation of 0.00. This implies that the learning objectives of the HOTS Learning Package are strongly aligned with fostering higher-order thinking skills, effectively challenging students to progress through the SOLO levels, and promoting deep analysis, synthesis, and independent inquiry.

These findings align with Thomas (2024), who emphasized that learning objectives should be student-centered, measurable, and designed to facilitate knowledge application and integration. His study highlights that well-structured learning objectives contribute to meaningful learning experiences, ensuring that students can apply their knowledge beyond rote memorization. Similarly, the results of this study implies that the learning objectives in the HOTS Learning Package effectively promote critical thinking and higher-order cognitive skills in science.

Table 2 presents the level of the HOTS Learning Package component based on the SOLO Framework in terms of Instructional Content, specifically evaluating how well the content promotes critical analysis, problem-solving, and

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application of concepts, as well as how effectively it supports students' progression through higher SOLO levels and stimulates higher-order thinking skills.

TABLE 2. Level of HOTS Learning Package Component based on SOLO Framework in terms of Instructional Content

The Instructional Content…	Mean	SD	Remarks
…promotes critical analysis, evaluation, and problem-solving skills.	3.83	0.38	Strongly Agree
…provides opportunities for students to apply concepts in complex scenarios.	3.83	0.38	Strongly Agree
…engages students in activities that require advanced reasoning and synthesis.	4.00	0.00	Strongly Agree
…is structured to support students' progression through higher SOLO levels.	4.00	0.00	Strongly Agree
…includes relevant science concepts that stimulate HOTS.	4.00	0.00	Strongly Agree
Weighted Mean	3.93		
SD	0.25		
Verbal Interpretation	Very High		

Table 2 shows that the instructional content of the HOTS Learning Package is rated as Very High in promoting higher-order thinking skills, with the computed weighted mean of 3.93 and a standard deviation of 0.25. This implies that the instructional content of the HOTS Learning Package is highly effective in promoting critical analysis, problem-solving, and advanced reasoning. The structured presentation of content supports students' cognitive progression through higher SOLO levels while ensuring engagement with relevant science concepts that stimulate higher-order thinking skills.

These findings align with Tinio (2022), who emphasized that instructional content should be designed to enhance students' ability to analyze, evaluate, and synthesize knowledge. His study highlights that well-structured instructional content plays a crucial role in fostering deep learning and cognitive development. Similarly, the results of this study implies that the instructional content in the HOTS Learning Package is instrumental in supporting students' higher-order thinking skills by providing opportunities for complex application and reasoning. The materials are deliberately organized to challenge students beyond rote memorization, requiring them to draw connections between concepts, justify their reasoning, and approach problems from multiple perspectives. According to Tinio, such design principles are essential for cultivating learners who can think independently and adaptively, especially in dynamic academic and real-world settings.

Table 3 presents the level of the HOTS Learning Package component based on the SOLO Framework in terms of Learning Activities, specifically evaluating how well the activities engage students in higher-order thinking processes such as analysis, evaluation, synthesis, and application, and how effectively they promote cognitive development aligned with the SOLO levels.

Table 3 indicates that the learning activities of the HOTS Learning Package are rated as Very High in fostering higher-order thinking skills, with the computed weighted mean of 3.83 and a standard deviation of 0.37 indicates a Very High level. This implies that the learning activities within the HOTS Learning Package are highly effective in promoting student engagement, critical thinking, and problem-solving. The activities are structured to encourage students to analyze and apply scientific concepts, ensuring their progression toward higher-order thinking skills. Furthermore, the tasks provided in the package allow students to reflect on their learning and apply it to new contexts, fostering deeper comprehension and cognitive development.

TABLE 3. Level of HOTS Learning Package Component based on SOLO Framework in terms of Learning Activities

The Learning Activities…	Mean	SD	Remarks
…actively engage students in critical and creative thinking processes.	4.00	0.00	Strongly Agree
…provide diverse and engaging tasks that require higher-order thinking and problem-solving.	3.83	0.38	Strongly Agree
…encourage students to reflect on and apply their learning to new contexts, promoting deeper understanding.	3.83	0.38	Strongly Agree
…are designed to encourage application and analysis of scientific concepts.	3.83	0.38	Strongly Agree
…challenge students to engage with complex concepts at higher SOLO levels, supporting their progression toward HOTS.	3.67	0.48	Strongly Agree
Weighted Mean	3.83		
SD	0.37		
Verbal Interpretation	Very High		

These findings align with Alcantara (2024), who emphasized that learning activities should actively engage students in critical and creative thinking processes while supporting their cognitive development. His study highlights that effective learning activities are those that require students to apply, analyze, and synthesize information in meaningful ways. This indicates that a pedagogical shift from passive reception of knowledge to active knowledge construction. By encouraging learners to navigate complex tasks, reflect on their understanding, and make informed decisions, such activities foster deeper engagement and long-term retention. The results of this study implies that the learning activities in the HOTS Learning Package successfully meet these criteria, making them an essential tool in enhancing students' higher-order thinking skills. Additionally, the package's emphasis on problem-solving, inquiry-based tasks, and reflective practices aligns with Alcantara's framework for active learning. These features not only cultivate intellectual curiosity but also empower students to take ownership of their learning process, equipping them with the skills necessary for academic success and real-world problem-solving. The HOTS Learning Package not only supports curriculum goals but also capable in promoting lifelong learning habits by nurturing students' ability to think independently and critically.

Table 4 presents the level of the HOTS Learning Package component based on the SOLO Framework in terms of Assessment, specifically evaluating how well the assessments measure higher-order thinking skills, how effectively they align with the different SOLO levels, and how accurately they reflect students' cognitive progress.

Table 4 reveals that the assessment component of the HOTS Learning Package is rated as Very High in effectively evaluating higher-order thinking skills, with the computed weighted mean of 3.90 and a standard deviation of 0.30. This

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implies that the assessment tasks within the HOTS Learning Package are highly effective in evaluating students' higher-order thinking skills. The results reveal that the assessments are designed to challenge students to apply, analyze, and evaluate scientific concepts, ensuring their progression through the relational and extended abstract levels of SOLO taxonomy. Additionally, the findings signify that the assessments provide meaningful feedback that supports students' cognitive development and reflective understanding.

TABLE 4. Level of HOTS Learning Package Component based on SOLO Framework in terms of Assessment

The Assessment…	Mean	SD	Remarks
…tasks are crafted to evaluate students' ability to apply higher-order thinking.	4.00	0.00	Strongly Agree
…challenges students to demonstrate understanding across SOLO levels, especially at relational and extended abstract levels.	3.83	0.38	Strongly Agree
…allows for evaluating students' analysis, synthesis, and evaluative skills.	4.00	0.00	Strongly Agree
…provides meaningful feedback that supports HOTS development.	3.67	0.48	Strongly Agree
…aligns with measuring students' critical and reflective understanding of science concepts.	4.00	0.00	Strongly Agree
Weighted Mean	3.90		
SD	0.30		
Verbal Interpretation	Very High		

These findings align with Richards (2022), who emphasized that assessment serves as a crucial tool for evaluating students' knowledge, skills, and learning progress. Similarly, the assessment component of the HOTS Learning Package was intentionally designed to promote critical thinking, problem-solving, and deeper understanding. The results indicate that this component successfully integrates these principles, thereby providing students with meaningful opportunities to engage cognitively at advanced levels. This alignment reinforces the validity of the package's design and its relevance in promoting meaningful learning experiences in the classroom.

Table 5 presents the level of the HOTS Learning Package component based on the SOLO Framework in terms of Student Reflection, specifically evaluating how effectively the reflection activities encourage metacognition, support deeper understanding, and align with higher-order thinking as categorized by the SOLO levels.

TABLE 5. Level of HOTS Learning Package Component based on SOLO Framework in terms of Student Reflection

The Student Reflection…	Mean	SD	Remarks
…prompts encourage deep thinking about their learning process.	3.83	0.38	Strongly Agree
…helps students articulate their understanding.	3.83	0.38	Strongly Agree
…encourages students to set goals for future learning.	3.67	0.48	Strongly Agree
…allows students to connect new knowledge to prior experiences.	4.00	0.00	Strongly Agree
…provides value in recognizing their learning journey.	3.83	0.38	Strongly Agree
Weighted Mean	3.83		
SD	0.37		
Verbal Interpretation	Very High		

Table 5 shows that the student reflection component of the HOTS Learning Package is rated as Very High in supporting metacognitive awareness and deeper understanding, with the computed weighted mean of 3.83 and a standard deviation of 0.37. This implies that student reflection is an integral part of the learning process, enabling students to critically evaluate their progress, articulate their understanding, and connect new knowledge to prior experiences. The results reveal that the reflection prompts effectively encourage deep thinking and self-assessment, which are essential in fostering metacognitive awareness and independent learning. Furthermore, the findings signify that student reflection supports the development of goal-setting habits, reinforcing a continuous learning mindset.

These findings align with Clayton (2024), who emphasized that student reflection enhances the learning experience by helping learners interpret and connect new information to their prior knowledge. His study highlights that reflection strengthens students' ability to critically assess their learning journey, leading to deeper comprehension and improved cognitive engagement. The results indicate that the reflection component of the HOTS Learning Package is well-structured to support the development of higher-order thinking skills and self-directed learning. Moreover, the structured reflection activities encouraged metacognitive awareness, allowing students to monitor and regulate their thought processes more effectively. Clayton also noted that reflection serves as a bridge between learning and application, making it easier for students to transfer knowledge across different contexts. In this way, the reflection elements embedded in the HOTS Learning Package play a pivotal role in fostering lifelong learning habits and nurturing thoughtful, analytical learners who are capable of adapting to complex challenges.

Level of HOTS Learning Package Features based on SOLO Framework

In this study, the level of HOTS Learning Package based on SOLO Framework Features refers to Appropriateness, Instructional Design, Usability, Complexity, and Coherence. The following tables show the specific statements evaluated, along with the corresponding mean scores, standard deviations, remarks, and verbal interpretations as provided by the respondents.

Table 6 presents the level of the HOTS Learning Package features based on the SOLO Framework in terms of Appropriateness, specifically evaluating the extent to which the package supports the development of higher-order thinking skills in science.

Table 6 shows that the appropriateness of the HOTS Learning Package is rated as Very High, with the computed weighted mean of 4.00 and a standard deviation of 0.00, signifying that the learning package is deemed highly appropriate for fostering higher-order thinking skills in science education. These findings indicate that the HOTS Learning Package is well-aligned with the cognitive demands of the SOLO Framework, effectively targeting students' development of advanced reasoning, problem-solving, and analytical skills. The perfect ratings across all statements

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further reveal that the learning package successfully meets the needs of learners engaging in complex cognitive tasks.

TABLE 6. Level of HOTS Learning Package Features based on SOLO Framework in terms of Appropriateness

The HOTS Learning Package based on SOLO Framework…	Mean	SD	Remarks
…is appropriate for supporting students' development of higher-order thinking skills in science.	4.00	0.00	Strongly Agree
…is suitable for promoting complex, higher-order cognitive skills.	4.00	0.00	Strongly Agree
…reflects the SOLO Framework and effectively targets HOTS.	4.00	0.00	Strongly Agree
…addresses students' needs for advanced cognitive engagement.	4.00	0.00	Strongly Agree
…aligns with higher-order thinking goals in science education.	4.00	0.00	Strongly Agree
Weighted Mean	4.00		
SD	0.00		
Verbal Interpretation	Very High		

This result aligns with Tyler (2021), who emphasized that effective instructional design ensures that educational resources are meaningful, structured, and aligned with students' cognitive development needs. The HOTS Learning Package provides an appropriate foundation for advancing students' higher-order thinking abilities, reinforcing the significance of structured instructional materials in science education. Such alignment not only facilitates deeper conceptual understanding but also promotes active engagement and sustained interest in scientific inquiry. This focus on appropriateness ensures that the materials are tailored to students' developmental stages and cognitive capacities, making the learning experience both accessible and challenging. Moreover, appropriate instructional design helps prevent cognitive overload. Tyler's framework also highlights that well-calibrated content improves learners' confidence and motivation, as they are more likely to experience success when tasks are suited to their current level of understanding. In this regard, the HOTS Learning Package demonstrates instructional sensitivity by balancing complexity with clarity, enabling students to progress through higher-order tasks without becoming overwhelmed. This thoughtful design supports both academic achievement and the development of independent learning skills.

Table 7 presents the level of HOTS Learning Package features based on the SOLO Framework in terms of Instructional Design, specifically evaluating how well the instructional design facilitates critical thinking, supports progression in higher-order thinking, and engages students in a logical, adaptable sequence.

Table 7 shows that the instructional design of the HOTS Learning Package is rated as Very High, with the computed weighted mean of 3.93 with a standard deviation of 0.25, signifying that the instructional design is highly effective in fostering higher-order thinking skills (HOTS). These findings indicate that the structured design of the learning package effectively supports students' cognitive progression, ensuring that learning activities and instructional content logically build toward deeper understanding. The package is also perceived as adaptable, allowing for meaningful engagement with scientific concepts.

TABLE 7. Level of HOTS Learning Package Features based on SOLO Framework in terms of Instructional Design

The HOTS Learning Package based on SOLO Framework…	Mean	SD	Remarks
…incorporates an instructional design that facilitates critical thinking and problem-solving skills.	4.00	0.00	Strongly Agree
…supports students' progression in higher-order thinking through structured design.	4.00	0.00	Strongly Agree
…engages students in a logical sequence that builds towards complex understanding.	3.83	0.38	Strongly Agree
…is adaptable for promoting deep cognitive engagement with scientific content.	3.83	0.38	Strongly Agree
…aligns with the SOLO Framework to effectively foster HOTS.	4.00	0.00	Strongly Agree
Weighted Mean	3.93		
SD	0.25		
Verbal Interpretation	Very High		

This result aligns with Fernandez (2024), who emphasized that instructional design ensures educational content remains engaging and relevant by following a systematic process that caters to students' needs, interests, and preferences. The HOTS Learning Package adheres to this principle by providing a structured yet flexible instructional approach that enhances students' deep cognitive engagement with scientific content.

Table 8 presents the level of HOTS Learning Package features based on the SOLO Framework in terms of Usability, specifically assessing how user-friendly the package is for teachers and students, and how effectively it supports independent exploration, critical thinking, and smooth integration into science lessons.

TABLE 9. Level of HOTS Learning Package Features based on SOLO Framework in terms of Usability

The HOTS Learning Package based on SOLO Framework…	Mean	SD	Remarks
…is user-friendly and enhances teachers' ability to facilitate HOTS-focused activities.	3.83	0.38	Strongly Agree
…supports students' independent exploration and critical thinking.	3.83	0.38	Strongly Agree
…provides a straightforward framework for implementing HOTS tasks.	3.83	0.38	Strongly Agree
…makes higher-order thinking activities accessible and manageable for students.	3.83	0.38	Strongly Agree
…supports smooth integration into science lessons focused on developing HOTS.	4.00	0.00	Strongly Agree
Weighted Mean	3.87		
SD	0.34		
Verbal Interpretation	Very High		

Table 8 shows that the usability of the HOTS Learning Package is rated as Very High, with the computed weighted mean of 3.87 and a standard deviation of 0.34, signifying that the learning package is highly effective and accessible in facilitating higher-order thinking skills (HOTS). These findings indicate that the HOTS Learning Package is user-friendly, providing a clear structure for implementing higher-order thinking activities. It allows students to engage in independent exploration while ensuring that teachers can seamlessly integrate it into science lessons. Additionally, the

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package makes complex cognitive tasks more manageable and accessible for learners.

This result aligns with Redish (2023), who highlighted that usability is determined by characteristics such as learnability, efficiency, and subjective satisfaction. The effectiveness of the HOTS Learning Package in supporting critical thinking and smooth integration into science instruction reflects these usability principles, ensuring that students and teachers can navigate and utilize the materials efficiently to achieve meaningful learning outcomes. Furthermore, incorporating user feedback during the development of the HOTS Learning Package contributes to continuous improvement, enhancing its overall accessibility and functionality. Redish's emphasis on subjective satisfaction underscores the importance of designing materials that not only perform well but also engage and motivate users, fostering a positive learning environment.

Table 9 presents the level of HOTS Learning Package features based on the SOLO Framework in terms of Complexity, specifically evaluating how well the tasks are designed to challenge students appropriately, promote critical thinking, and support progression through increasing levels of cognitive demand.

TABLE 9. Level of HOTS Learning Package Features based on SOLO Framework in terms of Complexity

The HOTS Learning Package based on SOLO Framework…	Mean	SD	Remarks
…presents tasks with appropriate complexity to develop HOTS in science.	3.83	0.38	Strongly Agree
…challenges students to think critically and make connections at higher SOLO levels.	3.83	0.38	Strongly Agree
…gradually increases complexity to advance students' cognitive skills.	4.00	0.00	Strongly Agree
…is balanced to stimulate deep engagement without overwhelming students.	3.83	0.38	Strongly Agree
…supports extended abstract thinking, encouraging synthesis and evaluation.	3.83	0.38	Strongly Agree
Weighted Mean	3.87		
SD	0.34		
Verbal Interpretation	Very High		

Table 9 shows that the complexity of the HOTS Learning Package is rated as Very High, with the computed weighted mean of 3.87 and a standard deviation of 0.34, signifying that the learning package effectively incorporates appropriate levels of complexity to develop higher-order thinking skills (HOTS) in science. These findings indicate that the HOTS Learning Package is well-structured, ensuring that tasks gradually increase in complexity to advance students' cognitive abilities. It effectively challenges students to engage in extended abstract thinking without being overwhelming.

This result aligns with Kearsley (2024), who emphasized that the complexity of instructional content is defined by the depth of conceptual connections and the cognitive processes required for learning. The structured progression of difficulty within the HOTS Learning Package reflects this principle, enabling students to develop advanced reasoning skills and deep engagement with scientific concepts.

Table 10 presents the level of HOTS Learning Package features based on the SOLO Framework in terms of Coherence, specifically assessing how well the components integrate to provide a unified and logically connected learning experience. The table highlights smooth transitions, alignment of objectives, content, activities, and assessments, and the cohesive integration of SOLO levels.

Table 10. Level of HOTS Learning Package Features based on SOLO Framework in terms of Coherence

The HOTS Learning Package based on SOLO Framework…	Mean	SD	Remarks
…components work well together for a unified learning experience.	3.83	0.38	Strongly Agree
…provides smooth and logical transitions between different sections.	3.83	0.38	Strongly Agree
…integrates each component seamlessly, ensuring that objectives, content, activities, and assessments align.	3.83	0.38	Strongly Agree
…encourages students to build on prior knowledge and reach advanced understanding at their own pace.	4.00	0.00	Strongly Agree
…integrates the SOLO levels cohesively to foster HOTS effectively.	4.00	0.00	Strongly Agree
Weighted Mean	3.90		
SD	0.30		
Verbal Interpretation	Very High		

Table 10 shows that the coherence of the HOTS Learning Package is rated as Very High, with the computed weighted mean of 3.90 and a standard deviation of 0.30 indicates a Very High level, signifying that the learning package effectively ensures alignment and integration among its components to provide a unified learning experience. These findings indicate that the HOTS Learning Package maintains a well-structured and cohesive framework, ensuring smooth transitions between different sections and logical integration of objectives, instructional content, learning activities, and assessments. The coherence of the learning package also allows students to progress systematically, reinforcing prior knowledge while building towards higher-order thinking skills (HOTS).

This result aligns with Schechter (2022), who emphasized that coherence in instructional design is achieved through a deep understanding of educational goals and their alignment across various learning components.

Level of Students' Cognitive Development while using HOTS Learning Package based on SOLO Framework

In this study, the level of students' cognitive development while using HOTS learning Package refers to Vocabulary Development, Reading Comprehension, Knowledge Acquisition, Conceptual Understanding, and Application of Knowledge. The following tables show the specific statements evaluated, along with the corresponding mean scores, standard deviations, remarks, and verbal interpretations as provided by the respondents.

Table 11 presents the level of students' cognitive development while using the HOTS Learning Package in terms of Vocabulary Development, specifically assessing how the package helped students understand, use, and retain scientific terms.

Table 11 shows that students' cognitive development in vocabulary reached to a Very High level, with the computed weighted mean of 3.32 and a standard deviation of 0.56, signifying that the learning package effectively supports students in understanding, remembering, and applying

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scientific vocabulary. This result implies that the HOTS Learning Package enhances students' confidence in using scientific terms, introduces new vocabulary in meaningful contexts, and aids in the correct application of terminology in discussions and explanations. The findings highlight the package's role in reinforcing vocabulary retention.

TABLE 11. Level of Students' Cognitive Development while using HOTS Learning Package in terms of Vocabulary Development

The HOTS Learning Package…	Mean	SD	Remarks
…helped me understand scientific terms better.	3.29	0.52	Strongly Agree
…introduced new vocabulary words that I can now use in sentences.	3.40	0.59	Strongly Agree
…made me confident in using scientific vocabulary in discussions.	3.22	0.58	Strongly Agree
…helped me remember and use new scientific terms correctly.	3.36	0.58	Strongly Agree
…improved my ability to define and explain scientific concepts.	3.35	0.51	Strongly Agree
Weighted Mean	3.32		
SD	0.56		
Verbal Interpretation	Very High		

These results align with Foshay (2021), who emphasized that instructional design plays a crucial role in ensuring that students engage with subject-specific vocabulary in a way that enhances comprehension and application. By integrating structured vocabulary-building activities, the HOTS Learning Package supports students' cognitive growth and scientific literacy.

Table 12 presents the level of students' cognitive development while using the HOTS Learning Package in terms of Reading Comprehension, specifically evaluating how the package supports students in understanding reading materials, identifying key ideas, making connections, and summarizing scientific content.

TABLE 12. Level of Students' Cognitive Development while using HOTS Learning Package in terms of Reading Comprehension

The HOTS Learning Package…	Mean	SD	Remarks
…made the reading materials easy to understand.	3.50	0.58	Strongly Agree
…helped me identify the main ideas and supporting details in texts.	3.51	0.52	Strongly Agree
…questions helped me grasp key concepts in the readings.	3.27	0.56	Strongly Agree
…enhanced my ability to make connections between different scientific topics.	3.37	0.55	Strongly Agree
…improved my ability to summarize information in my own words.	3.37	0.58	Strongly Agree
Weighted Mean	3.40		
SD	0.56		
Verbal Interpretation	Very High		

Table 12 shows that students' cognitive development in reading comprehension reached a very high level, with the computed weighted mean of 3.40 and a standard deviation of 0.56, signifying that the learning package effectively supports students in understanding and analyzing reading materials. This result signifies that the HOTS Learning Package enhances students' ability to identify main ideas, grasp key concepts, and make meaningful connections between scientific topics. Furthermore, the package has helped students summarize information effectively, which is an essential skill in developing higher-order thinking.

These findings align with Eason (2024), who emphasized that usability and instructional design directly impact students' reading comprehension. According to Eason, educational materials that are structured, clear, and engaging improve students' ability to process and retain information, ultimately leading to better comprehension and learning outcomes. The HOTS Learning Package, with its carefully designed reading materials and comprehension questions, ensures that students can engage critically with scientific texts, fostering deeper understanding. The package addresses diverse learning preferences and promotes active interaction with the material. Moreover, the integration of scaffolding techniques within the reading tasks supports learners in building connections between new information and prior knowledge, which is crucial for meaningful comprehension.

Table 13 presents the level of students' cognitive development while using the HOTS Learning Package in terms of Knowledge Acquisition, specifically evaluating how effectively the package provides new information, clarifies concepts, supports retention, and builds confidence in applying knowledge.

TABLE 13. Level of Students' Cognitive Development while using HOTS Learning Package in terms of Knowledge Acquisition

The HOTS Learning Package…	Mean	SD	Remarks
…provided me with a lot of new information.	3.57	0.53	Strongly Agree
…explanations and examples were clear and helpful.	3.56	0.53	Strongly Agree
…activities helped me retain and recall information effectively.	3.43	0.59	Strongly Agree
…improved my understanding of various scientific concepts.	3.40	0.54	Strongly Agree
…made me confident in applying the knowledge I acquired to new situations.	3.33	0.61	Strongly Agree
Weighted Mean	3.46		
SD	0.57		
Verbal Interpretation	Very High		

Table 13 shows that students' cognitive development in knowledge acquisition reached to a Very High level, with the computed weighted mean of 3.46 and a standard deviation of 0.57, signifying that the learning package effectively supports students in acquiring and retaining new knowledge. This result signifies that the HOTS Learning Package provides clear explanations and examples, helping students understand and recall scientific concepts more effectively. Additionally, the structured activities within the package enable students to apply newly acquired knowledge with confidence in different contexts, reinforcing deep learning.

These findings align with Moller (2023), who emphasized that knowledge acquisition is a cognitive process that relies on structured instruction and opportunities for meaningful engagement. According to Moller, learning materials that scaffold complex concepts and gradually increase in difficulty enhance students' ability to internalize and apply knowledge efficiently. The HOTS Learning Package, with its well-designed instructional content and activities, ensures that

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students develop a strong foundation in scientific concepts while promoting higher-order thinking.

Table 14 presents the level of students' cognitive development while using the HOTS Learning Package in terms of Conceptual Understanding, specifically evaluating how well the package helps students grasp underlying scientific concepts, explain principles clearly, deepen their understanding, relate concepts to real-world scenarios, and improve their ability to articulate ideas in their own words.

TABLE 14. Level of Students' Cognitive Development while using HOTS Learning Package in terms of Conceptual Understanding

The HOTS Learning Package…	Mean	SD	Remarks
…helped me understand the underlying concepts in science.	3.29	0.52	Strongly Agree
…enabled me to explain scientific principles clearly.	3.19	0.60	Strongly Agree
…activities helped deepen my understanding of the concepts.	3.43	0.62	Strongly Agree
…allowed me to relate the concepts learned to real-world scenarios.	3.48	0.55	Strongly Agree
…improved my ability to explain concepts in my own words.	3.27	0.60	Strongly Agree
Weighted Mean	3.33		
SD	0.59		
Verbal Interpretation	Very High		

Table 14 shows that students' cognitive development in conceptual understanding reached a very high level, with the computed weighted mean of 3.33 and a standard deviation of 0.59, signifying that the learning package effectively enhances students' comprehension of scientific concepts and principles. This result indicates that the HOTS Learning Package supports students in grasping fundamental scientific ideas, enabling them to explain concepts clearly and relate them to real-world applications. The structured activities provided in the package promote deeper engagement, reinforcing students' ability to articulate their understanding in their own words.

These findings align with Dewald (2021), who emphasized that conceptual understanding in education is fostered through structured learning experiences that encourage connections between theoretical knowledge and real-world applications. According to Dewald, instructional materials that integrate active learning strategies, real-life problem-solving, and reflective exercises improve students' ability to synthesize information and develop meaningful insights. The HOTS Learning Package, by incorporating these principles, ensures that students achieve a deeper and more connected understanding of scientific concepts. Through thoughtfully designed activities, students are not only exposed to core scientific theories but are also prompted to apply these ideas to authentic contexts, thereby bridging the gap between abstract knowledge and practical use. This approach ultimately cultivates learners who are better equipped to think critically.

Table 15 presents the level of students' cognitive development while using the HOTS Learning Package in terms of Application of Knowledge, specifically assessing how the package supports students in applying learned concepts to solve problems, design experiments, use scientific methods, analyze data, and perform in tasks requiring knowledge application.

TABLE 15. Level of Students' Cognitive Development while using HOTS Learning Package in terms of Application of Knowledge

The HOTS Learning Package…	Mean	SD	Remarks
…helped me apply knowledge to solve problems.	3.43	0.60	Strongly Agree
…enabled me to design experiments or projects using learned concepts.	3.42	0.60	Strongly Agree
…made me confident in using scientific methods to tackle challenges.	3.36	0.61	Strongly Agree
…helped me develop skills to analyze and interpret data.	3.45	0.55	Strongly Agree
…improved my performance in tasks and tests requiring the application of knowledge.	3.43	0.54	Strongly Agree
Weighted Mean	3.42		
SD	0.58		
Verbal Interpretation	Very High		

Table 15 shows that students' cognitive development in the application of knowledge reached a very high level, with the computed weighted mean of 3.42 and a standard deviation of 0.58. This signifies that the learning package effectively supports students in applying acquired knowledge to solve problems, design experiments, and interpret data in scientific contexts. The results indicate that the HOTS Learning Package fosters students' confidence in using scientific methods and reasoning to address challenges. Through engaging activities and problem-solving tasks, students develop analytical skills that enhance their ability to apply learned concepts in real-world scenarios.

These findings align with Hardre (2020), who emphasized that learning environments designed to promote cognitive application must integrate complex, real-world tasks that require students to synthesize, evaluate, and apply knowledge in meaningful ways. Hardre's research highlights that students engage more deeply with content when instructional materials encourage inquiry-based learning, experimentation, and data analysis, all of which are embedded in the HOTS Learning Package.

Level of Students' Performance in Science after using HOTS Learning Package based on SOLO Framework

In this study, the level of students' performance is examined through the written task and the performance task. The written task, conducted as a summative test at the end of the intervention, evaluates students' understanding and retention of the concepts covered. Meanwhile, the performance task is assessed using an analytic rubric to measure how well students can apply their knowledge and skills in practical or real-life scenarios.

Table 16 presents the level of students' performance in science in terms of Written Task, showing the distribution of scores across descriptive performance levels. The results indicate that 19 students (15.83%) achieved an Outstanding performance (41-50 points), 61 students (50.83%) attained a Very Satisfactory rating (31-40 points), and 40 students (33.33%) were classified under Satisfactory (21-30 points). No students fell under the Fairly Satisfactory (11-20) or Did Not Meet Expectation (0-10) categories.

Table 16 shows that students' performance in science, in terms of written tasks, was rated as Very Satisfactory, with the computed weighted mean of 33.96 and a standard deviation of 5.26, implying that students demonstrated strong competence

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in science concepts as assessed through the written task. The results indicate that the HOTS Learning Package effectively supported students' ability to engage with and apply scientific knowledge in a structured written assessment format.

TABLE 16. Level of Students' Performance in Science in terms of Written Task after using HOTS Learning Package based on SOLO Framework

Score	Written Task		Descriptive Equivalent
	f	%	
41 - 50	19	15.83	Outstanding
31 - 40	61	50.83	Very Satisfactory
21 - 30	40	33.33	Satisfactory
11 - 20	0	0.00	Fairly Satisfactory
0 - 10	0	0.00	Did not meet Expectation
Total	120	100	
Weighted Mean	33.96		
SD	5.26		
Verbal Interpretation	Very Satisfactory		

These findings align with Dewald (2021), who emphasized that instructional designs incorporating complexity and structured problem-solving significantly enhance students' academic performance by reinforcing critical thinking, comprehension, and application skills. Dewald's study indicates that students exposed to higher-order thinking tasks perform better in assessments requiring analytical reasoning and conceptual mastery, reinforcing the effectiveness of the HOTS Learning Package in elevating student achievement.

Table 17 presents the level of students' performance in science in terms of Performance Task, illustrating the distribution of scores across descriptive performance levels. The performance levels are categorized according to score ranges and their corresponding descriptive equivalents. The performance task was evaluated using analytical rubrics. The results indicate that 104 students (86.67%) achieved an Outstanding rating (33-40 points), while 16 students (13.33%) attained a Very Satisfactory rating (25-32 points). No students fell under the Satisfactory (17-24), Fairly Satisfactory (9-16), or Did Not Meet Expectation (0-8) categories.

TABLE 17. Level of Students' Performance in Science in terms of Performance Task after using HOTS Learning Package based on SOLO Framework

Score	Performance Task		Descriptive Equivalent
	f	%	
33 - 40	104	86.67	Outstanding
25 - 32	16	13.33	Very Satisfactory
17 - 24	0	0.00	Satisfactory
9 - 16	0	0.00	Fairly Satisfactory
0 - 8	0	0.00	Did not meet Expectation
Total	120	100	
Weighted Mean	34.80		
SD	3.40		
Verbal Interpretation	Outstanding		

Table 17 shows that students' performance in science, in terms of performance task, after using the HOTS Learning Package based on the SOLO Framework, was rated as Outstanding level, with the computed weighted mean of 34.80 and a standard deviation of 3.40, signifying that student demonstrated a high level of proficiency in applying scientific concepts through performance tasks. This implies that the HOTS Learning Package effectively fostered hands-on learning, problem-solving, and application of knowledge in practical tasks.

These results align well with Hardre's (2020) research, which underscores the importance of cognitively demanding tasks and cooperative learning environments. Hardre posits that when students are engaged in tasks that require higher-order thinking within a supportive group context, they develop better problem-solving skills and the ability to transfer classroom knowledge to real-world situations. This theoretical backing helps explain why the HOTS Learning Package, emphasizing hands-on, problem-based learning activities structured around cognitive complexity, produces positive outcomes. The package's design not only challenges students intellectually but also foster collaboration through group-based tasks that encourage discussion, shared reasoning, and collective decision-making. Such an approach is consistent with Hardre's findings, which suggest that learning is most effective when cognitive rigor is balanced with social interaction and peer support.

Test of Relationship between the HOTS Learning Package based on SOLO Framework and the Students' Cognitive Development

To test the significant relationship between the HOTS Learning Package based on SOLO Framework and the students' cognitive development in terms of Vocabulary Development, Reading Comprehension, Knowledge Acquisition, Conceptual Understanding, and Application of Knowledge, they were treated statistically using Real Statistics Data Analysis Tool with the Pearson Product-Moment Correlation Coefficient.

Table 18 presents the correlation analysis of the significant relationship between the HOTS Learning Package components and features based on the SOLO Framework and students' cognitive development. Specifically, the table reports Pearson correlation coefficients along with their corresponding significance values (2-tailed) for multiple cognitive domains, including vocabulary development, reading comprehension, knowledge acquisition, conceptual understanding, and the application of knowledge. The analysis covers components such as learning objectives, instructional content, learning activities, assessment methods, and student reflection. In addition, it evaluates features of the learning package itself, including appropriateness, instructional design, usability, complexity, and coherence.

Table 18 shows that all components and features of the HOTS Learning Package exhibit a statistically significant positive relationship with students' cognitive development ($p < 0.05$). However, the strength of these relationships varies, as reflected in the computed correlation coefficients (r-values).

At a 0.05 level of significance, the null hypothesis stating, "There is no significant relationship between the HOTS Learning Package based on SOLO Framework and students' cognitive development," is rejected. This indicates that the HOTS Learning Package significantly influences students' cognitive development, particularly in fostering vocabulary acquisition, comprehension, and higher-order thinking skills.

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TABLE 18. Significant Relationship between the HOTS Learning Package based on SOLO Framework and the Students' Cognitive Development

HOTS Learning Package based on SOLO Framework		Students' Cognitive Development				
		Vocabulary Development	Reading Comprehension	Knowledge Acquisition	Conceptual Understanding	Application of Knowledge
COMPONENT						
Learning Objectives	Pearson Correlation	0.2046	0.1695	0.1585	0.1864	0.1509
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig
Instructional Content	Pearson Correlation	0.1415	0.1185	0.1080	0.1330	0.1088
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig
Learning Activities	Pearson Correlation	0.0802	0.0666	0.0584	0.0773	0.0627
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig
Assessment	Pearson Correlation	0.1521	0.1249	0.1136	0.1409	0.1129
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig
Student Reflection	Pearson Correlation	0.0802	0.0666	0.0584	0.0773	0.0627
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig
FEATURES						
Appropriateness	Pearson Correlation	0.2046	0.1695	0.1585	0.1864	0.1509
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig
Instructional Design;	Pearson Correlation	0.1415	0.1185	0.1080	0.1330	0.1088
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig
Usability	Pearson Correlation	0.1031	0.0859	0.0764	0.0983	0.0799
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig
Complexity	Pearson Correlation	0.0843	0.0708	0.0628	0.0813	0.0668
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig
Coherence	Pearson Correlation	0.1086	0.0914	0.0821	0.1038	0.0854
	Significance (2-Tailed)	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
	N	119	119	119	119	119
	Analysis	Sig	Sig	Sig	Sig	Sig

These results align with Hajid (2024), who emphasized that cognitive development is a multifaceted process influenced by structured learning interventions. Hajid highlighted that reading comprehension, as a critical cognitive skill, requires both lower-level and higher-level processes, including vocabulary recognition and conceptual understanding. Similarly, the structured design of the HOTS Learning Package ensures that students engage in activities that foster meaningful learning and cognitive progression, supporting their ability to analyze, synthesize, and apply knowledge effectively. The significant relationships across all variables further confirm the effectiveness of the package in enhancing students' higher-order thinking skills, reinforcing the role of well-structured instructional materials in facilitating cognitive growth. The variation in correlation strengths also suggests that certain components of the package may contribute more substantially to specific dimensions of cognitive development than others. This nuanced pattern points to the differentiated impact of each feature, indicating that while all are effective, their influence may manifest through varied cognitive pathways such as reasoning, abstraction, or problem-solving.

Test of Effect of Utilizing HOTS Learning Package based on SOLO Framework to the Students' Performance

To test the significant effect between the HOTS Learning Package Component based on SOLO Framework and the students' performance, they were treated statistically using Real Statistics Data Analysis Tools using the Regression Analysis.

Table 19 presents the test of effect of utilizing the HOTS Learning Package based on the SOLO Framework on students’ performance in science, evaluated using Written and Performance Tasks.

Table presents the results of the analysis on the effect of utilizing the HOTS Learning Package based on the SOLO Framework on students’ performance in science, as measured by Written and Performance Tasks. The analysis shows that the Features of the learning package had a statistically

significant effect on both the Written Task (F = 4.7946, p = 0.0005) and the Performance Task (F = 5.3847, p = 0.0002). In contrast, the Components of the package did not yield a significant effect on either assessment type, with p-values of 0.2603 and 0.2753, respectively. These results suggest that specific features of the HOTS Learning Package play a critical role in enhancing student performance in science.

TABLE 19. Effect of Utilizing HOTS Learning Package based on SOLO Framework to the Students' Performance

HOTS Learning Package based on SOLO Framework	Students' Performance	F-value	p-value
Components	Written Task	1.3207	0.2603
	Performance Task	1.2849	0.2753
Features	Written Task	4.7946	0.0005
	Performance Task	5.3847	0.0002

$p < 0.05$

From these findings, at the 0.05 level of significance, the null hypothesis, "There is no significant effect between the HOTS Learning Package based on the SOLO Framework and the students' performance," is partially rejected. This indicates that while the Components alone do not significantly affect student performance, the Features of the learning package have a notable and positive impact, thereby contributing more meaningfully to the improvement of students' outcomes in science tasks. This means that while Components provide necessary structure, it is the Features that actively drive improvements in students' performance.

As stated by Hasim et al. (2016), the effectiveness of HOTS-based learning in science is influenced by various instructional features, including critical thinking, creative thinking, and metacognitive skills, which collectively enhance students' academic achievement and problem-solving abilities.

IV. Conclusion and Recommendations

Based on the findings of this study, the following conclusions were drawn regarding the development and validation of the HOTS Learning Package based on the SOLO Framework in improving students' cognitive development and performance in science.

The study established that there is a significant relationship between the utilization of the HOTS Learning Package based on the SOLO Framework and students' cognitive development. Thus, the posited null hypothesis is rejected. This conclude that the HOTS Learning Package based on the SOLO Framework effectively supports students in developing higher-order thinking skills, enhancing their ability to analyze, evaluate, and apply knowledge in science.

Moreover, while the components of the HOTS Learning Package do not significantly affect students' performance, its features have a significant effect. Thus, the posited null hypothesis is partially rejected. This means that while components provide necessary structure, it is the features that actively drive improvements in students' performance. This also implies that merely establishing components is insufficient for improving student performance, therefore, a greater emphasis must be given to implementing features that actively engage learners and support higher-order thinking skills.

Furthermore, the qualitative responses revealed that the HOTS Learning Package based on SOLO Framework effective in improving their cognitive development and academic performance through its high-quality content, active, engaging, and collaborative learning tasks, real-world applications with reflection and assessment.

Based on the findings and conclusions made, the following recommendations were forwarded.

Science Teachers may be encouraged to adopt and integrate the HOTS learning package based on SOLO Framework into their instructional practices.

Future iterations of the HOTS learning package based on SOLO Framework may continue to emphasize its features such as appropriateness, instructional design, usability, complexity, and coherence. The inclusion of high-quality content, engaging and collaborative tasks, real-world applications, and opportunities for reflection and assessment should be sustained and further strengthened.

Future Researchers may conduct similar research across different grade levels, schools, or subjects to determine the broader applicability of the HOTS Learning Package based on SOLO Framework.

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