

Science Learning Activity Sheet (LAS): Interventional Tool to Increase Learners' Cognitive Skill and Assessment

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Abstract—This descriptive study aims to determine the effectiveness of science learning activity sheet as interventional tool to increase the learners' cognitive skills and assessment. Specifically, it aimed to determine the level of components and characteristics of science learning activity sheet, level of learners' cognitive skill and assessment using the science learning activity sheet. Also, the significant difference between the learners' performance in terms of pre-assessment and assessment, the significant effect of components and characteristics of science learning activity sheet on the learners' cognitive skills, and the significant effect between the components and characteristics of science learning activity sheet on the learners' assessment. This study utilized quasi-experimental design to determine the effects of science learning activity sheets on learners' cognitive skills and assessment. This research design has been beneficial for assessing educational methods, especially when examining the advancement of cognitive skills. Purposive sampling was utilized in this study, wherein selected forty (40) Grade 8 – least learned learners of Don Manuel Rivera Memorial National High School, Pila, Laguna, S.Y. 2024-2025 were chosen. Researcher-made learning activity sheets and questionnaire were also used in this study validated by master teachers of DepEd Laguna. Based on the results of evaluations, the level of components of science learning activity sheet in terms of learning competency, learning objectives, pre-assessment, learning approach, learning task, evaluation, and reflection was verbally interpreted as very high among the respondents. Also, the level of learners' cognitive skills using the science learning activity sheet in terms of knowledge acquisition, memory retention, visual perceptions and logical reasoning arrived was verbally interpreted as very high among the respondents. Based on the findings of the study, the following conclusions were drawn. There are several significant effects between the components and characteristics of the science learning activity sheet and learners' cognitive skills. Learners' logical thinking abilities are greatly influenced by learning goals, among other things. Additionally, pre-assessment shows significant effects on memory retention, visual perceptions and logical reasoning. The learning approach is significantly related to logical reasoning. For the characteristics, adaptability significantly affects knowledge acquisition and visual perceptions while its effect on memory retention is marginally significant. Furthermore, usability has significant effects on knowledge acquisition, memory retention and logical reasoning. Also, the components and characteristics of the activity sheets examined do not significantly effect on learners' performance on formative assessments in the study while pre-assessment emerged as the only component with a statistically significant effect on learners' summative assessment scores. Based on the results and conclusion posted in the study, the recommendation was formulated. Teachers should implement regular feedback or assessments to monitor student progress and adjust the Learning Activity Sheets (LAS). This method

will help identify learning gaps and improve instructional resources accordingly.

I. INTRODUCTION

In today's educational landscape, fostering the cognitive development of students is a primary focus for educators. It is crucial to integrate effective tools and strategies into the teaching and learning process to achieve this goal. The study of science plays a significant role in improving students' critical thinking, problem-solving, and analytical skills, which are essential for success in the 21st century.

In order to foster success, well-being, and the full potential of every student, school interventions are essential. Through tutoring, mentoring, and counseling, interventions seek to improve academic achievement and foster vital social and emotional competencies. Students can improve their overall academic performance, acquire new talents, and overcome obstacles to learning by using these strategies.

Learning activity sheets can be used to improve student learning by providing personalized and contextualized learning experiences. These are designed on the scientific approach, which helps students develop a deeper understanding of the subject matter. Teachers can use learning activity sheets to ensure that students complete tasks and activities that are suitable for their learning needs. By using these sheets, teachers can enhance the appeal of lessons and activities, leading to better comprehension and engagement among students. The researcher believes that the learning activity sheet can improve students' cognitive abilities and performance and that instructors can use it as an assessment tool to assess students' prior knowledge, learning outcomes, and learning processes; meanwhile, students can use it to track the progress of their own learning.

This study, the “Science Learning Activity Sheet (LAS) as an interventional tool”, aims to determine the significant effects of the learning activity sheets between the learners' cognitive skills and assessment.

1.1 Statement of the Problem

Problem/s which were addressed by the research

The main purpose of this study is to determine the effects of Science Learning Activity Sheet (LAS) as Interventional Tool to Increase Learners' Cognitive Skill and Learners' Assessment specifically it sought answer to the following questions:

1. What is the level of components of science learning activity sheet in terms of:
 - 1.1 learning competency;
 - 1.2 learning objectives;
 - 1.3 pre-assessment
 - 1.4 learning approach;
 - 1.5 learning task;
 - 1.6 evaluation; and
 - 1.7 reflection?
2. What is the level of characteristics of science learning activity sheet in terms of:
 - 2.1 clarity;
 - 2.2 adaptability
 - 2.3 congruency;
 - 2.4 usability; and
 - 2.5 relevance?
3. What is the level of learners' cognitive skills using the science learning activity sheet in terms of:
 - 3.1 knowledge acquisition;
 - 3.2 memory retention;
 - 3.3 visual perceptions; and
 - 3.4 logical reasoning?
4. What is the level of learners' assessment using the science learning activity sheet in terms of:
 - 4.1 formative assessment; and
 - 4.2 summative assessment?
5. Is there a significant difference between the learners' performance in terms of pre-assessment and assessment?
6. Does the components and characteristics of science learning activity sheet have a significant effect on the learners' cognitive skills?
7. Is there a significant effect between the components and characteristics of science learning activity sheet on the learners' assessment?

II. METHODOLOGY

This study utilized quasi-experimental design to determine the effects of science learning activity sheets on learners' cognitive skills and assessment. This research design has been beneficial for assessing educational methods, especially when examining the advancement of cognitive skills. Purposive sampling was utilized in this study, wherein selected forty (40) Grade 8 – least learned learners of Don Manuel Rivera Memorial National High School, Pila, Laguna, S.Y. 2024-2025 were chosen. Researcher-made learning activity sheets and questionnaire were also used in this study validated by master teachers of DepEd Laguna.

III. RESULTS AND DISCUSSION

This part presents the different results and discussed the results from treating the data gathered in this study. All specific questions in Chapter 1 under the statement of the problem were answered in this chapter supported by tables. It presents the data gathered about the significant effect between components, characteristics of science learning activity sheet and learners' assessment using the science learning activity sheet. In particular, the study sought to address the following:

Level of Acceptability of Components of Science Learning Activity Sheet

In this study, the level of components of science learning activity sheet refers to learning competency, learning objectives, pre-assessment, learning approach, learning task, evaluation, and reflection.

The statement, mean, standard deviation, remarks, and verbal interpretation are displayed in the tables below from the standpoint of respondents.

TABLE 1. Level of components of science learning activity sheet in terms of learning competency

Statements	Mean	SD	Remarks
Learning Activity Sheets align with the required learning competencies for the subject.	4.28	0.67	Strongly Agree
The competencies are clearly defined in the Learning Activity Sheets.	4.40	0.73	Strongly Agree
Learning Activity Sheets support the achievement of learning competencies	4.53	0.63	Strongly Agree
The activities within the Learning Activity Sheets facilitate mastery of the competencies	4.25	0.77	Strongly Agree
The competencies included in the Learning Activity Sheets to real-world applications	4.40	0.73	Strongly Agree
Weighted Mean	4.37		
SD	0.44		
Verbal Interpretation			Very High

Table 1 presents the level of Learning Activity Sheets (LAS) based on their alignment with required learning competencies, clarity of competencies, support for competency achievement, facilitation of mastery, and real-world application. The results indicate a very high overall rating, with a weighted mean of 4.37 and a standard deviation of 0.44, suggesting strong agreement among respondents. The highest-rated aspect is the LAS's ability to support learning competencies (4.53), while all other aspects also received high ratings, reflecting the effectiveness of the LAS in achieving learning objectives.

Ayado and Berame (2022) conducted another study focusing on additional materials that match the Department of Education's Most Essential Learning Competencies (MELCs). The study discovered that tailored LAS improved student involvement and skill development, particularly in science topics, when compared to conventional resources. The group that received additional LAS in the experiment had superior post-test outcomes compared to the group that used regular modules, highlighting the significance of personalized content in online learning.

TABLE 2. Level of components of science learning activity sheet in terms of learning objectives

Statements	Mean	SD	Remarks
Learning objectives are clearly stated in the Learning Activity Sheets.	4.50	0.39	Strongly Agree
Learning objectives are aligned with the curriculum standards.	4.18	0.92	Strongly Agree
Learning objectives align with the overall curriculum standards.	4.25	0.73	Strongly Agree
Learning objectives are relevant to the students' needs and experiences	4.55	0.74	Strongly Agree
The activities in the Learning Activity Sheets are engaging in helping to achieve the learning objectives.	4.35	0.69	Strongly Agree
Weighted Mean	4.37		
SD	0.53		
Verbal Interpretation			Very High

Table 2 presents the level of the Learning Activity Sheets (LAS) based on the clarity, alignment, and relevance of

learning objectives, as well as the engagement level of activities. The overall assessment yielded a very high rating, with a weighted mean of 4.37 and a standard deviation of 0.53, indicating strong agreement among respondents. The highest-rated aspect is the relevance of learning objectives to students' needs and experiences (4.55), highlighting the LAS's effectiveness in addressing student learning requirements.

Karatas & Arpaci (2021), highlighted the significance of well-defined learning goals in LAS. They observed that clearly defined goals give students a precise idea of what they need to accomplish, boosting motivation and aiding in maintaining attention on particular results. Learning objectives help teachers match activities with desired competencies, ensuring that the LAS stays focused on outcomes.

TABLE 3. Level of components of science learning activity sheet in terms of pre-assessment

Statements	Mean	SD	Remarks
The pre-assessment aligns with the learning objectives of the lesson.	4.68	0.52	Strongly Agree
The questions in the pre-assessment effectively measure my prior knowledge.	4.68	0.52	Strongly Agree
The pre-assessment is easy to understand and follow.	4.33	0.88	Strongly Agree
The pre-assessment provides a good introduction to the topic.	4.53	0.63	Strongly Agree
The format and structure of the pre-assessment are well-organized.	4.60	0.77	Strongly Agree
Weighted Mean	4.56		
SD	0.45		
Verbal Interpretation			Very High

Table 3 presents the level of the pre-assessment in the Learning Activity Sheets (LAS) based on its alignment with learning objectives, effectiveness in measuring prior knowledge, clarity, introduction to the topic, and organization. The results indicate a very high overall rating, with a weighted mean of 4.56 and a standard deviation of 0.45, reflecting strong agreement among respondents. The highest-rated aspects are the alignment of the pre-assessment with learning objectives and its effectiveness in measuring prior knowledge (4.68), highlighting its usefulness in assessing students' readiness for the lesson.

Gatlin-Nash et al. (2021) examine the impact of pre-assessment data on teachers' perceptions of student skills. Their findings indicate that using formal assessment data at the start of instruction leads to more accurate evaluations of student performance. This approach enhances teaching strategies and minimizes bias, especially for diverse students, underscoring the importance of data-informed teaching for equitable education.

Table 4 presents the level of the Learning Activity Sheets (LAS) in promoting active learning, clarity of instructions, encouragement of critical thinking, engagement, and suitability for Grade 8 students. The overall assessment yielded a very high rating, with a weighted mean of 4.48 and a standard deviation of 0.50, indicating strong agreement among respondents. The highest-rated aspect is the LAS's effectiveness in promoting active learning (4.68), emphasizing its role in enhancing student engagement and participation

TABLE 4. Level of components of science learning activity sheet in terms of learning approach

Statements	Mean	SD	Remarks
Learning Activity Sheets (LAS) effectively promote active learning among students	4.68	0.52	Strongly Agree
The instructions are clear for the learning activities in the Learning Activity Sheets (LAS).	4.45	0.67	Strongly Agree
Learning Activity Sheets (LAS) encourage critical thinking and problem-solving skills	4.40	0.70	Strongly Agree
The learning approaches used in the LAS are engaging	4.40	0.70	Strongly Agree
The learning approach of the activities are suitable in grade 8 level	4.48	0.81	Strongly Agree
Weighted Mean	4.48		
SD	0.50		
Verbal Interpretation			Very High

Munna & Kalam (2021) highlighted the efficiency of active learning approaches like PBL and IBL in their research. These approaches motivate students to participate actively in the learning process, leading to better retention and application of knowledge.

TABLE 5. Level of components of science learning activity sheet in terms of learning task

Statements	Mean	SD	Remarks
Learning tasks in the Learning Activity Sheets (LAS) are clearly defined.	4.53	0.81	Strongly Agree
Learning tasks align with the learning objectives	4.58	0.39	Strongly Agree
Learning tasks for students are engaging	4.53	0.67	Strongly Agree
Learning tasks are appropriate for the students' cognitive levels	4.60	0.58	Strongly Agree
Learning tasks effectively promote independent learning	4.58	0.54	Strongly Agree
Weighted Mean	4.56		
SD	0.40		
Verbal Interpretation			Very High

Table 5 presents the level of the learning tasks in the Learning Activity Sheets (LAS) based on clarity, alignment with learning objectives, engagement, appropriateness for students' cognitive levels, and promotion of independent learning. The overall assessment received a very high rating, with a weighted mean of 4.56 and a standard deviation of 0.40, indicating strong agreement among respondents. The highest-rated aspect is the appropriateness of learning tasks for students' cognitive levels (4.60), highlighting the LAS's effectiveness in providing suitable and engaging learning experiences.

The first principles of instruction by Merrill (2020) highlight that learning is most successful when tasks are created to involve students in solving real-world problems. His study shows that learning activities should stem from real-life scenarios, enabling learners to hone skills and utilize information in situations resembling those in the real world. Merrill suggests that learning activities should start with basic tasks and then advance to more challenging ones, helping students as they develop their skills.

Table 6 presents the level of the assessment process in the Learning Activity Sheets (LAS) based on clarity, alignment with learning objectives, effectiveness in measuring understanding, appropriateness for the learning level, and

overall value for academic growth. The results indicate a very high overall rating, with a weighted mean of 4.56 and a standard deviation of 0.47, reflecting strong agreement among respondents. The highest-rated aspect is the appropriateness of the evaluation for students' learning level (4.70), highlighting its effectiveness in assessing student comprehension and progress.

TABLE 6. Level of components of science learning activity sheet in terms of evaluation

Statements	Mean	SD	Remarks
The evaluation process is clear and well-structured.	4.63	0.76	Strongly Agree
The evaluation effectively measures my understanding of the subject.	4.45	0.63	Strongly Agree
The evaluation content aligns with the learning objectives.	4.48	0.63	Strongly Agree
The level of the evaluation is appropriate for my learning level.	4.70	0.51	Strongly Agree
The overall evaluation process is a valuable tool for my academic growth.	4.53	0.74	Strongly Agree
Weighted Mean	4.56		
SD	0.47		
Verbal Interpretation	Very High		

Cook et al., (2024) examine how student evaluations assess teaching performance in higher education. They analyze the collection and use of student feedback for measuring effectiveness, finding that evaluations are influenced by factors like instructor personality, grading, and course difficulty. The study recommends a more comprehensive evaluation approach that combines student feedback with peer reviews and teaching portfolios for accurate assessments of teaching quality.

TABLE 7. Level of components of science learning activity sheet in terms of reflection

Statements	Mean	SD	Remarks
The learning activity sheets encourage students to reflect on their learning experiences.	4.75	0.54	Strongly Agree
The reflection prompts included in the LAS are thought-provoking and meaningful.	4.33	0.65	Strongly Agree
The reflection activities promote critical thinking among students.	4.40	0.73	Strongly Agree
The Learning Activity Sheets (LAS) encourages students to set personal learning goals based on their reflections.	4.50	0.63	Strongly Agree
The reflections help students identify areas of strength and improvement in their learning.	4.78	0.47	Strongly Agree
Weighted Mean	4.55		
SD	0.42		
Verbal Interpretation	Very High		

Table 7 presents the level of reflection activities in the Learning Activity Sheets (LAS) based on their ability to encourage student reflection, promote critical thinking, and support personal learning goals. The overall assessment received a very high rating, with a weighted mean of 4.55 and a standard deviation of 0.42, indicating strong agreement among respondents. The highest-rated aspect is the effectiveness of reflections in helping students identify areas of strength and improvement (4.78), emphasizing the LAS's role in fostering self-awareness and continuous learning.

Level Of Acceptability of Characteristics of Science Learning Activity Sheet

In this study, the level of characteristics of science learning activity sheet refers to clarity, adaptability, congruency, usability, and relevance.

The verbal interpretation, mean, standard deviation, comments, and statement are presented in the tables below from the viewpoint of the respondents.

TABLE 8. Level of characteristics of science learning activity sheet in terms of clarity

Statements	Mean	SD	Remarks
The instructions provided in the learning activity sheets are clear and easy to understand.	4.70	0.51	Strongly Agree
The objectives of the learning activities are clearly stated.	4.55	0.63	Strongly Agree
The format and layout of the learning activity sheets contribute to their clarity.	4.48	0.67	Strongly Agree
The examples provided in the learning activity sheets are relevant and aid in understanding the tasks.	4.45	0.84	Strongly Agree
The connection between activities and learning outcomes is clearly explained.	4.48	0.87	Strongly Agree
Weighted Mean	4.53		
SD	0.52		
Verbal Interpretation	Very High		

Table 8 presents the clarity and organization of the Learning Activity Sheets (LAS) based on the instructions, objectives, format, relevance of examples, and connection to learning outcomes. The overall assessment received a very high rating, with a weighted mean of 4.53 and a standard deviation of 0.52, indicating strong agreement among respondents. The highest-rated aspect is the clarity and ease of understanding of instructions (4.70), emphasizing the LAS's effectiveness in guiding students through their learning activities.

Clarity was identified as a key factor in the creation of self-learning modules (SLMs) in a study conducted by Galicha & Lazaro (2022). Their research on mathematical modules showed that explicit directions and stimulating inquiries resulted in enhanced student engagement. The reviewers observed that clear instructions aided in making tasks easier to complete, leading to enhanced creativity and better comprehension of the teachings.

TABLE 9. Level of characteristics of science learning activity sheet in terms of adaptability

Statements	Mean	SD	Remarks
The learning activity sheets can be easily modified to cater to different learning styles.	4.45	0.80	Strongly Agree
The content of the learning activity sheets is flexible enough to be adjusted based on students' individual needs.	4.45	0.63	Strongly Agree
The learning activity sheets include various activities that allow for differentiation among learners.	4.23	0.63	Strongly Agree
The instructions and tasks can be modified without losing the core objectives of the lesson.	4.43	0.70	Strongly Agree
The layout of the learning activity sheets allows for easy adaptation in group settings.	4.35	0.99	Strongly Agree
Weighted Mean	4.38		
SD	0.51		
Verbal Interpretation	Very High		

Table 9 presents the adaptability and flexibility of the Learning Activity Sheets (LAS) in catering to different learning styles, individual needs, and group settings. The overall assessment received a very high rating, with a weighted mean of 4.38 and a standard deviation of 0.51, indicating strong agreement among respondents. The highest-rated aspects are the modifiability of the LAS for different learning styles and individual needs (4.45), highlighting their versatility in accommodating diverse learners while maintaining lesson objectives.

Adaptability in education greatly affects career growth. Research on working students in Europe shows that adaptability helps them balance education, work, and personal life. Those who adjust well tend to perform better academically and face fewer stress-related issues, benefiting their long-term careers (Stead et al., 2021). Additionally, strong time management skills are crucial for motivation and success, especially for students juggling work and studies (Hauschildt et al., 2021).

TABLE 10. Level of characteristics of science learning activity sheet in terms of congruency

Statements	Mean	SD	Remarks
The learning activity sheets align well with the intended learning objectives.	4.70	0.51	Strongly Agree
The tasks within the learning activity sheets are consistent with the curriculum standards.	4.50	0.55	Strongly Agree
The structure and format of the learning activity sheets enhance the clarity of the objectives.	4.40	0.73	Strongly Agree
The assessment tasks included in the learning activity sheets are appropriate for measuring the intended learning outcomes.	4.35	0.73	Strongly Agree
The learning activity sheets facilitate a coherent learning experience from one topic to the next.	4.68	0.47	Strongly Agree
Weighted Mean	4.53		
SD	0.41		
Verbal Interpretation	Very High		

Table 10 presents the congruency of the Learning Activity Sheets (LAS) with learning objectives, curriculum standards, structure, assessment tasks, and coherence in learning progression. The results indicate a very high overall rating, with a weighted mean of 4.53 and a standard deviation of 0.41, reflecting strong agreement among respondents. The highest-rated aspects are the alignment of the LAS with learning objectives (4.70) and its coherence in facilitating learning progression (4.68), highlighting the LAS's effectiveness in providing a structured and goal-oriented learning experience.

Table 11 presents the usability of the Science Learning Activity Sheets (LAS) based on attributes like clarity, layout, relevance, adaptability, and organization. The findings indicate a high usability level, with a weighted mean of 4.61 and a standard deviation of 0.41, reflecting strong participant agreement. The highest-rated statement was "The content in the learning activity sheets is organized logically" (Mean = 4.78, SD = 0.52), indicating that students perceive the materials as well-structured. There was also significant agreement on the clarity of instructions and the relevance of

resources, both scoring a mean of 4.68, highlighting the LAS's effectiveness in enhancing the learning experience.

TABLE 11. Level of characteristics of science learning activity sheet in terms of usability

Statements	Mean	SD	Remarks
The instructions provided in the learning activity sheets are clear and concise.	4.68	0.61	Strongly Agree
The layout of the learning activity sheets is visually appealing and facilitates learning.	4.50	0.55	Strongly Agree
The resources and materials included in the learning activity sheets are relevant and useful.	4.68	0.57	Strongly Agree
The learning activity sheets can be easily adapted for different learning styles.	4.43	0.63	Strongly Agree
The content in the learning activity sheets is organized logically.	4.78	0.52	Strongly Agree
Weighted Mean	4.61		
SD	0.41		
Verbal Interpretation	Very High		

Gunesequera et al., (2019), found that adhering to usability standards enhances the efficiency of online learning platforms. They emphasized the importance of features like simple navigation and prompt user feedback.

TABLE 12. Level of characteristics of science learning activity sheet in terms of relevance

Statements	Mean	SD	Remarks
The content of the learning activity sheets aligns well with the curriculum objectives.	4.65	0.61	Strongly Agree
The learning activity sheets address the specific needs of the learners in my class.	4.53	0.59	Strongly Agree
The topics covered in the learning activity sheets are relevant to real-world applications.	4.63	0.66	Strongly Agree
The learning activities included in the sheets foster engagement with the subject matter.	4.73	0.55	Strongly Agree
The learning activity sheets incorporate current trends and issues relevant to the subject area.	4.58	0.54	Strongly Agree
Weighted Mean	4.62		
SD	0.39		
Verbal Interpretation	Very High		

Table 12 presents the relevance, alignment, and engagement of the Learning Activity Sheets (LAS) concerning curriculum objectives, learner needs, real-world applications, and current trends. The results indicate a very high overall rating, with a weighted mean of 4.62 and a standard deviation of 0.39, reflecting strong agreement among respondents. The highest-rated aspect is the engagement fostered by the learning activities (4.73), highlighting the LAS's effectiveness in making the subject matter interactive and meaningful for students.

Level of Acceptability of Learners' Cognitive Skills Using the Science Learning Activity Sheet

In this study, the level of learners' cognitive skills using the science learning activity sheet refers to knowledge acquisition, memory retention, visual perceptions and logical reasoning.

From the respondents' viewpoints, the following tables display the statement, mean, standard deviation, remarks, and verbal interpretation.

Table 13 presents the effectiveness of the Learning Activity Sheets (LAS) in enhancing knowledge retention,

confidence in application, relevance to learning goals, feedback for improvement, and integration of new knowledge. The overall assessment received a very high rating, with a weighted mean of 4.60 and a standard deviation of 0.51, indicating strong agreement among respondents. The highest-rated aspect is increased confidence in applying learned concepts (4.73), highlighting the LAS's role in reinforcing student understanding and practical application of knowledge.

TABLE 13. Level of learners' cognitive skills using the science learning activity sheet in terms of knowledge acquisition

Statements	Mean	SD	Remarks
I can recall information presented in the learning activity sheets with ease.	4.65	0.61	Strongly Agree
I feel more confident in applying what I've learned from the activity sheets.	4.73	0.55	Strongly Agree
I find that the learning activity sheets are relevant to my learning goals.	4.48	0.67	Strongly Agree
I receive feedback from the learning activities helps improve my knowledge acquisition.	4.63	0.66	Strongly Agree
I can integrate knowledge from the learning activity sheets into my existing understanding of the subject.	4.50	0.77	Strongly Agree
Weighted Mean	4.60		
SD	0.51		
Verbal Interpretation	Very High		

In two separate learning settings, Cukurova, Bennett, and Abrahams (2017) examine how students acquire and use their knowledge. Both support knowledge acquisition, but guided settings enhance students' ability to transfer knowledge to new contexts. The study emphasizes the significance of instructional design and contextual alignment in promoting effective learning and knowledge transfer.

TABLE 14. Level of learners' cognitive skills using the science learning activity sheet in terms of memory retention

Statements	Mean	SD	Remarks
I am able to remember information from the learning activity sheets after completing them.	4.65	0.53	Strongly Agree
I find it easy to recall information learned from the activity sheets during assessments.	4.43	0.74	Strongly Agree
I use the learning activity sheets as a resource to review and enhance my memory.	4.63	0.58	Strongly Agree
I notice an improvement in my memory retention since using the learning activity sheets.	4.43	0.80	Strongly Agree
I can easily connect new information from the learning activity sheets to previously learned concepts.	4.53	0.63	Strongly Agree
Weighted Mean	4.53		
SD	0.50		
Verbal Interpretation	Very High		

Table 14 presents the level of Learning Activity Sheets (LAS) on students' memory retention, recall ability, and connection of new knowledge to prior learning. With a weighted mean of 4.53 and a standard deviation of 0.50, the overall evaluation received a very high grade, demonstrating a high degree of consensus among respondents. The highest-rated aspect is the ability to remember information after completing the LAS (4.65), emphasizing the effectiveness of the LAS in reinforcing learning and supporting long-term retention of concepts.

Davis et al., (2018) found that memory retention can be greatly improved by using effective learning methods like spaced repetition and retrieval practice. Reviewing material at longer intervals in spaced repetition aids in strengthening information in long-term memory. Recalling information, also known as retrieval practice, enhances neural connections and improves retention more effectively than passive review techniques.

TABLE 15. Level of learners' cognitive skills using the science learning activity sheet in terms of visual perceptions

Statements	Mean	SD	Remarks
I can easily interpret diagrams and visuals presented in the learning activity sheets.	4.53	0.63	Strongly Agree
I can easily understand the subject matter through visuals included in the learning activity sheets	4.63	0.62	Strongly Agree
I find it easier to recall information when it is accompanied by relevant images or graphics.	4.63	0.53	Strongly Agree
I can recognize and differentiate important details in illustrations used in the learning activity sheets.	4.50	0.55	Strongly Agree
I feel engage more with visual content, aiding my learning process using the learning activity sheet.	4.55	0.80	Strongly Agree
Weighted Mean	4.57		
SD	0.50		
Verbal Interpretation	Very High		

Table 15 presents the effectiveness of visual elements in the Learning Activity Sheets (LAS) in enhancing comprehension, recall, and engagement. The results indicate a very high overall rating, with a weighted mean of 4.57 and a standard deviation of 0.50, reflecting strong agreement among respondents. The highest-rated aspects are the ability to understand the subject matter through visuals (4.63) and improved recall with images or graphics (4.63), highlighting the importance of well-integrated visual content in supporting learning and retention.

A study conducted by Doshier & Lu (2017), investigated the impact of visual learning in educational settings, highlighting that learners' interpretation and absorption of visual cues can greatly impact their comprehension and memory of information. Graphs, charts, and images improve understanding by assisting learners in better integrating and organizing information. Presenting information in a multimodal way, including both text and visuals, results in improved retention compared to formats with only text.

Table 16 presents the level of the Learning Activity Sheets (LAS) on students' logical reasoning and problem-solving abilities. The overall assessment received a very high rating, with a weighted mean of 4.33 and a standard deviation of 0.70, indicating strong agreement among respondents. The highest-rated aspect is the ability to analyze problems effectively using logical reasoning strategies (4.18), highlighting the LAS's role in enhancing students' critical thinking and problem-solving skills.

A study by Peng & Kievit (2020), has shown that the use of inquiry-based learning and problem-solving tasks can greatly improve students' logical reasoning abilities. These strategies encourage students to analyze issues thoughtfully, question assumptions, and explore different options when

encountering a problem. Moreover, the study found that students who received explicit instruction in logical reasoning outperformed their peers in tasks that required critical thinking and analyzing arguments.

TABLE 16. Level of learners' cognitive skills using the science learning activity sheet in terms of logical reasoning

Statements	Mean	SD	Remarks
I am able to analyze problems effectively using the logical reasoning strategies presented in the learning activity sheets.	4.18	0.97	Strongly Agree
I feel confident in my ability to apply logical reasoning to solve complex problems after using the learning activity sheets.	4.28	0.81	Strongly Agree
I can effectively evaluate arguments and identify logical fallacies after engaging with the materials in the learning activity sheets.	4.45	0.71	Strongly Agree
I can articulate my reasoning process clearly when discussing problems from the learning activity sheets.	4.40	0.77	Strongly Agree
I believe that my logical reasoning skills have improved as a result of using the learning activity sheets.	4.35	1.01	Strongly Agree
Weighted Mean	4.33		
SD	0.70		
Verbal Interpretation	Very High		

Level of Acceptability of Learners' Assessment Using the Science Learning Activity Sheet

In this study, the level of learners' assessment using the science learning activity sheet refers to formative and summative assessments.

The following tables show the score, frequency, and descriptive equivalent from the perspectives of respondents.

TABLE 17. Level of learners' assessment using the science learning activity sheet in terms of Formative Assessment

Score	Assessment		Descriptive Equivalent
	F	%	
41 – 50	4	10.00	Outstanding
31 – 40	19	47.50	Very Satisfactory
21 – 30	10	25.00	Satisfactory
11 – 20	7	17.50	Fairly Satisfactory
0 – 10	0	0.00	Did not meet Expectation
Total	40	100	
Weighted Mean	30.38		
SD	8.23		
Verbal Interpretation	Very Satisfactory		

Table 17 presents the level of learners' assessment using the science learning activity sheet in terms of formative assessment. The table shows the distribution of scores among 40 learners, categorized by their performance. The majority of learners (47.5%) achieved scores between 31-40, corresponding to a "Very Satisfactory" rating. The overall weighted mean score is 30.38 with a standard deviation of 8.23, which is interpreted as "Very Satisfactory." The assessment reveals that most learners are performing at a satisfactory level, with no learners falling into the "Did not meet Expectation" category.

Research conducted by Made (2024), highlights the importance of formative assessment for educators to track student progress. It discusses techniques like exit tickets, quizzes, peer evaluations, and classroom observations, each

with unique benefits for assessing learning. These methods enable teachers to better understand student needs, offer timely feedback, and encourage active student engagement in their education.

TABLE 18. Level of learners' assessment using the science learning activity sheet in terms of Summative Assessment

Score	Assessment		Descriptive Equivalent
	F	%	
41 – 50	1	2.50	Outstanding
31 – 40	24	60.00	Very Satisfactory
21 – 30	12	30.00	Satisfactory
11 – 20	3	7.50	Fairly Satisfactory
0 – 10	0	0.00	Did not meet Expectation
Total	40	100	
Weighted Mean	32.25		
SD	6.80		
Verbal Interpretation	Very Satisfactory		

Table 18 presents the level of learners' assessment using the science learning activity sheet in terms of summative assessment. The table displays the performance distribution of 40 learners, with the majority (60%) scoring between 31-40, which corresponds to a "Very Satisfactory" rating. The weighted mean score is 32.25 with a standard deviation of 6.80, also interpreted as "Very Satisfactory." The data indicates that most learners performed well, with a small percentage (7.5%) falling under the "Fairly Satisfactory" category, and none of the learners failing to meet expectations.

Ali (2024) examines the limitations of summative assessment methods in Outcome-Based Education (OBE) and proposes an enhanced framework that organizes course materials by relevance to learning outcomes, assigns weightings, aligns with student goals, and evaluates module difficulty. A standardized rubric assesses all modules via a final exam, yielding a holistic score that reflects weighted achievement across various learning outcomes.

Test of Difference Between the Learners' Assessment Using the Science Learning Activity Sheet

To test the significant difference between the learners' assessment using the science learning activity sheet in terms of Formative and Summative Assessment they were treated statistically using Real Statistics Data Analysis Tools using the Test of difference.

TABLE 19. Test of Difference on the learners' assessment using the science learning activity sheet

Science learning activity sheet	Learners' assessment		M D	95% Confidence Interval of Difference		t	df	Sig (2-tailed)
	M	SD		L	U			
	Formative Assessment	30.38		8.23	1.875			
Summative Assessment	32.25	6.80						

Legend: *Significant at 0.05

Shown in Table 19 is the test of difference on the learners' assessment using the science learning activity sheet and the mean scores of the two assessments. Data obtained through a paired t-test indicated that the increase in the scores is significant (p < 0.05).

According to the study of Palmberg et. al (2024) highlighted that a thorough and varied approach to formative assessment is essential for boosting student motivation by fostering a sense of ownership over their learning experiences. Methods like peer feedback, self-assessment, instructor input, and interactive evaluation techniques helped create a more student-centered learning environment, leading to heightened engagement and deeper learning experiences.

Stanford University (2023) emphasizes the crucial role of summative assessment and feedback in measuring student learning and improving teaching effectiveness. The research indicates that summative assessments, such as exams and final projects, provide a structured approach to evaluate student performance; however, they should be accompanied by constructive feedback to enhance the learning process. Effectively designed summative assessments should align with course objectives, guarantee fairness, and encourage a deep understanding rather than simple rote memorization.

The findings indicate that learners' performance in formative assessments is similar to their performance in summative assessments. Despite the slight difference in means (1.875), the p-value of 0.0770 exceeds the 0.05 threshold for significance, suggesting that both types of assessments provide comparable insights into learner performance. Therefore, the difference between the two assessments is not statistically significant.

Test of Effect Between the Components, Characteristics of Science Learning Activity Sheet and Learners' Cognitive Skills

To test the significant effect between the components, characteristics of science learning activity sheet and learners' cognitive skills in terms of knowledge acquisition, memory retention, visual perceptions and logical reasoning they were treated statistically using Real Statistics Data Analysis Tools using the Regression Analysis.

TABLE 20. Significant Effect Between the Components, Characteristics Of Science Learning Activity Sheet And Learners' Cognitive Skills

Science Learning Activity Sheet		Learners' Cognitive Skills				
		Knowledge Acquisition	MR	VP	LR	
Components	Learning competency	Beta	0.004	0.010	0.010	-0.010
		t-value	0.036	0.066	0.072	-0.039
		p-value	0.972	0.948	0.943	0.969
	Learning objectives	Beta	0.000	0.152	0.112	0.733
		t-value	0.001	1.174	0.919	3.262
		p-value	1.000	0.251	0.366	0.003*
	Pre-assessment	Beta	0.219	0.622	0.408	0.853
		t-value	1.442	3.368	2.356	2.670
		p-value	0.161	0.002*	0.026*	0.013*
	Learning approach	Beta	-0.087	-0.161	0.069	-0.723
		t-value	-0.581	-0.875	0.402	-2.278
		p-value	0.566	0.389	0.691	0.031*
	Learning task	Beta	0.035	0.121	0.074	-0.686
		t-value	0.178	0.507	0.331	-1.659
		p-value	0.860	0.617	0.743	0.109
	Evaluation	Beta	0.046	0.048	0.047	-0.415
		t-value	0.262	0.222	0.233	-1.115
		p-value	0.795	0.826	0.817	0.275
Reflection	Beta	0.154	-0.297	0.348	0.407	
	t-value	0.812	-1.290	1.611	1.021	
	p-value	0.424	0.208	0.119	0.316	
Characteristics	Clarity	Beta	-0.152	-0.082	-0.366	0.663
		t-value	-0.778	-0.346	-1.646	1.613
		p-value	0.443	0.732	0.112	0.118
	Adaptability	Beta	0.357	0.308	0.357	0.460
		t-value	2.912	2.061	2.551	1.779
		p-value	0.007*	0.049	0.017*	0.087
	Congruency	Beta	-0.076	-0.208	-0.016	-0.915
		t-value	-0.330	-0.742	-0.061	-1.887
		p-value	0.744	0.465	0.952	0.070
	Usability	Beta	0.578	0.462	0.041	0.830
		t-value	3.787	2.482	0.234	2.578
		p-value	0.001*	0.020*	0.817	0.016*
	Relevance	Beta	0.236	0.193	0.162	-0.107
		t-value	1.690	1.130	1.013	-0.364
		p-value	0.103	0.268	0.320	0.719

Note: *p<0.05 is significant.

The data reveals several significant effects between the components and characteristics of the science learning activity sheet and learners' cognitive skills. Among the components, learning objectives significantly affect learners' logical reasoning skills ($p = 0.003$). Additionally, pre-assessment shows significant effects on memory retention ($p = 0.002$), visual perceptions ($p = 0.026$), and logical reasoning ($p = 0.013$). The learning approach is significantly related to logical reasoning ($p = 0.031$). For the characteristics, adaptability significantly affects knowledge acquisition ($p = 0.007$) and visual perceptions ($p = 0.017$), while its effect on memory retention is marginally significant ($p = 0.049$). Furthermore, usability has significant effects on knowledge acquisition ($p = 0.001$), memory retention ($p = 0.020$), and logical reasoning ($p = 0.016$). These findings emphasize that specific design elements of the activity sheets, particularly in how they assess and engage students, are influential in enhancing different aspects of cognitive development.

On the other hand, several components and characteristics of the science learning activity sheet do not exhibit significant effects on learners' cognitive skills. Learning competency, learning task, evaluation, and reflection show no significant relationship with any of the four cognitive skills, as all p -values exceed 0.05. Similarly, the characteristics of clarity, congruency, and relevance do not demonstrate any statistically significant effect on learners' knowledge acquisition, memory retention, visual perception, or logical reasoning. These results indicate that while these elements are part of the activity sheet, they may not directly influence students' cognitive outcomes in the context studied.

The analysis reveals that among the components and characteristics of the science learning activity sheet, none show a statistically significant effect on learners' formative assessment scores. Although pre-assessment and learning task yielded relatively high beta values (5.267 and 8.228, respectively), their corresponding p -values ($p = 0.294$ and $p = 0.207$) indicate no significant effect. Similarly, components such as learning competency, learning objectives, learning approach, evaluation, and reflection also did not significantly influence formative assessment outcomes. Among the characteristics, clarity approached significance ($p = 0.098$), indicating a potential influence, but still fell short of the conventional threshold. Other characteristics like adaptability, congruency, usability, and relevance also showed no significant effects. These results show that, overall, the components and characteristics of the activity sheets examined do not significantly influence learners' performance on formative assessments in the current study.

In contrast, pre-assessment emerged as the only component with a statistically significant effect on learners' summative assessment scores ($p = 0.015$), indicating that pre-assessment activities meaningfully support students' achievement in summative evaluations. This highlights the importance of gauging students' prior knowledge and readiness before engaging in deeper learning tasks. All other components including learning competency, learning objectives, learning approach, learning task, evaluation, and

reflection did not show significant relationships with summative assessment scores. Likewise, none of the characteristics of the activity sheet, such as clarity, adaptability, congruency, usability, and relevance, had a significant influence on learners' summative performance. These findings emphasize that while pre-assessment plays a critical role in enhancing summative outcomes, other factors within the activity sheet may have less direct effect.

TABLE 21. Significant Effect Between the Components, Characteristics of Science Learning Activity Sheet and Learners' Assessment

Science Learning Activity Sheet		Learners' Assessment		
			Formative	Summative
Components	Learning competency	Beta	-1.134	-0.286
		t-value	-0.285	-0.087
		p-value	0.778	0.931
	Learning objectives	Beta	0.870	1.901
		t-value	0.251	0.665
		p-value	0.804	0.512
	Pre-assessment	Beta	5.267	10.564
		t-value	1.071	2.599
		p-value	0.294	0.015*
	Learning approach	Beta	1.351	-1.114
		t-value	0.276	-0.276
		p-value	0.784	0.785
	Learning task	Beta	8.228	4.399
		t-value	1.293	0.837
		p-value	0.207	0.410
	Evaluation	Beta	-9.113	-0.818
		t-value	-1.593	-0.173
		p-value	0.123	0.864
Reflection	Beta	-8.089	-5.291	
	t-value	-1.317	-1.043	
	p-value	0.199	0.306	
Characteristics	Clarity	Beta	10.858	2.081
		t-value	1.716	0.398
		p-value	0.098	0.694
	Adaptability	Beta	-2.957	-4.306
		t-value	-0.743	-1.310
		p-value	0.464	0.201
	Congruency	Beta	-8.337	-3.115
		t-value	-1.117	-0.505
		p-value	0.274	0.618
	Usability	Beta	2.033	-1.524
		t-value	0.410	-0.372
		p-value	0.685	0.713
Relevance	Beta	-3.253	1.015	
	t-value	-0.717	0.271	
	p-value	0.480	0.789	

Note: * $p < 0.05$ is significant.

IV. CONCLUSION AND RECOMMENDATIONS

On the basis of the foregoing findings, the following conclusion was drawn.

There were several significant effects between the components and characteristics of the science learning activity sheet and learners' cognitive skills. Among the components, learning objectives significantly affect learners' logical reasoning skills. Additionally, pre-assessment shows

significant effects on memory retention, visual perceptions and logical reasoning. The learning approach is significantly related to logical reasoning. For the characteristics, adaptability significantly affects knowledge acquisition and visual perceptions, while its effect on memory retention is marginally significant. Furthermore, usability has significant effects on knowledge acquisition memory retention, and logical reasoning.

On the other hand, several components and characteristics of the science learning activity sheet do not exhibit significant effects on learners' cognitive skills. Learning competency, learning task, evaluation, and reflection show no significant relationship with any of the four cognitive skills. Similarly, the characteristics of clarity, congruency, and relevance do not demonstrate any statistically significant effect on learners' knowledge acquisition, memory retention, visual perception, or logical reasoning. These results indicate that while these elements are part of the activity sheet, they may not directly influence students' cognitive outcomes in the context studied.

There was no significant effect among the components and characteristics of the science learning activity sheet on learners' formative assessment scores. Similarly, components such as learning competency, learning objectives, learning approach, evaluation, and reflection also did not significantly influence formative assessment outcomes. Among the characteristics, clarity approached significance, indicating a potential influence, but still fell short of the conventional threshold. Other characteristics like adaptability, congruency, usability, and relevance also showed no significant effects. These results show that, overall, the components and characteristics of the activity sheets examined do not significantly influence learners' performance on formative assessments in the current study.

In contrast, pre-assessment emerged as the only component with a statistically significant effect on learners' summative assessment, indicating that pre-assessment activities meaningfully support students' achievement in summative evaluations. This highlights the importance of gauging students' prior knowledge and readiness before engaging in deeper learning tasks. All other components including learning competency, learning objectives, learning approach, learning task, evaluation, and reflection did not show significant relationships with summative assessment scores. Likewise, none of the characteristics of the activity sheet, such as clarity, adaptability, congruency, usability, and relevance, had a significant influence on learners' summative performance.

Based on the findings and conclusions, the following recommendations are proposed:

Teacher and curriculum developer should adopt adaptive learning strategies that tailor the educational experience to meet the individual needs of each student. By employing diverse assessment techniques, a more comprehensive evaluation of students' understanding and skills can be accomplished.

Teachers should integrate blended learning approaches, inquiry-based teaching methods, and technology-enhanced

learning resources to strengthen student comprehension and evaluation outcomes.

Teachers should implement regular feedback systems and formative assessments to monitor student progress and adjust the Learning Activity Sheets (LAS) as necessary. This method will help identify learning gaps and improve instructional resources accordingly.

Students should actively participate in learning tasks, exercises, and reflections provided in the LAS to enhance their understanding of scientific concepts and improve their cognitive skills, such as critical thinking and logical reasoning.

Future researcher should investigate factors such as teaching methods, student involvement, classroom interactions, and prior knowledge to develop a more comprehensive approach to improving student success using learning activity sheets in science.

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