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Development of Differentiated Teaching Modules to Enhance Students' Creative Thinking Skills

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ABSTRACT

This research aims to describe the validity and practicality of a teaching module, as well as to determine the effectiveness of a differentiated teaching module. The study was conducted in Class VII of SMP State 11 Gorontalo Junior High School, Gorontalo City, involving 32 students. The developed module refers to the Research and Development (R&D) method, with the ADDIE model employed as the development framework. The resulting products include a teaching module, student worksheets (LKPD), and a learning outcome test. Data collection was carried out using validation sheets, lesson implementation sheets, student activity sheets, creative thinking tests, and student response questionnaires. The collected data were analyzed by calculating the percentage of each obtained score. The validators assigned a validity score of 95.7 for the teaching module, 95.3 for the LKPD, and 96 for the learning outcome tests. The results showed that the average score for implementing teacher activities was 95.15, categorized as very good. Student activities were also categorized as "very good," with an average score of 94.07. Student response results indicated a very good category, with 69.82% strongly agreeing and 30.18% agreeing. Students' creative thinking skills were measured using the normalized gain (n-gain), which fell into the "moderate" category with a score of 0.42. The analysis of the creative thinking test also showed improvement across all indicators of creative thinking.

Keywords: creative thinking skills, differentiation, teaching module.

INTRODUCTION

Differentiated instruction has been increasingly acknowledged as an approach capable of accommodating students' diverse characteristics, needs, and potentials. Each student has varying readiness levels, learning styles, and interests, making it essential to implement flexible and adaptive instructional strategies to support their optimal development. Differentiated instruction offers a solution by adapting the learning process based on students' readiness, interests, and learning profiles. Thus, teachers are able to provide more meaningful, challenging, and personalized learning experiences that align with each student's potential. Numerous studies have shown that the implementation of differentiated instruction can enhance student engagement, strengthen conceptual understanding, and foster broader exploration of creative ideas. Differentiated instruction is an approach that accommodates the diverse needs of all students (Avivi et al., 2023). It encompasses

four key aspects that should be demonstrated by teachers during the instructional process: content, process, product, and learning environment. These four components are adapted to align with the characteristics and needs of the students (Wahyuni, 2022). The distinguishing features of differentiated instruction include a learning environment that invites student engagement, a curriculum with clearly defined learning objectives, ongoing assessment, teacher responsiveness to students' learning needs, and effective classroom management (Sarie, 2022).

One of the primary goals of education is to develop students' creative thinking skills and creativity, which are essential for addressing the challenges of the 21st century. Creative thinking encompasses skills such as generating new ideas, thinking flexibly, and finding innovative solutions to problems. On the other hand, creativity is the manifestation of creative thinking applied across various real-life contexts. Unfortunately, classroom instruction often remains oriented toward a one-size-fits-all approach, less effective in stimulating students' creative thinking and creativity. Creative thinking skills are essential for students, particularly in the teaching and learning process, as they play a critical role in fostering meaningful and innovative learning experiences. Therefore, through creative thinking skills, students are expected to understand, master, and solve problems. In addressing a problem, students should be able to propose new and creative ideas or solutions, enabling them to analyze and resolve the issue effectively.

A positive attitude among students is also essential in fostering the character value of learning creativity, as learning creativity is a key factor in helping students understand concepts in science subjects (Siregar, 2020). Creativity includes aptitude-related traits such as fluency, flexibility, and originality in thinking, as well as non-aptitude traits such as curiosity, a tendency to ask questions, and a desire to seek new experiences. One of the main problems in formal education is the low level of student comprehension and absorption during the learning process. This is evident in the average student learning outcomes, which remain considerably low. Such performance is likely a result of conventional instructional practices that fail to consider students' internal learning processes, particularly in how students process and construct knowledge (Amiruddin et al., 2020). The learning process continues to be dominated by the teacher, offering limited opportunities for students to develop independently through discovery and critical thinking (Madyani, 2020). Therefore, there is a need for teaching modules that allow students to enhance their thinking processes and creativity.

The development of differentiated teaching modules is expected to enhance students' creative thinking skills and creativity, which are crucial for overcoming learning challenges. Differentiated teaching modules can address these diverse needs more effectively, enabling more personalized and relevant instruction. Since each student has a unique learning style and needs, the instructional approach must be adapted accordingly to ensure meaningful and effective learning experiences. Teachers are required to use appropriate models, strategies, and methods that can accommodate the diverse characteristics of their students in order to ensure effective learning. Adopting a differentiated approach makes instruction more student-centered, allowing learners to engage actively while enhancing their creativity and creative thinking skills per the competencies demanded by 21st-century education.

MATERIALS & METHODS

This study is a research and development (R&D) project employing the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation). The developed product was validated by experts who assigned scores to each assessment aspect. To determine its practicality, observers monitored teacher and student

activities during instruction's opening, core, and closing phases. Observers provided scores for each evaluated aspect using a standardized rubric. The results were then analyzed to assess the level of practicality of the developed instructional materials. The effectiveness of the learning materials was determined through the analysis of learning outcome tests. Students were given a pre-test, followed by the learning intervention, and a post-test was administered at the end of the learning process.

The validation data of the instructional materials provided by the three validators were analyzed descriptively using quantitative methods. The average validation scores were interpreted according to the following criteria: 100 < very valid ≤ 81; 61 < valid ≤ 80; 41 < somewhat valid ≤ 60; 21 < less valid ≤ 40; and 0 < invalid ≤ 20 (Fatayah et al., 2020). The validation data of the instructional materials provided by the three validators were analyzed descriptively using quantitative methods. The average validation scores were interpreted according to the following criteria: 81 < very valid ≤ 100; 61 < valid ≤ 80; 41 < somewhat valid ≤ 60; 21 < less valid ≤ 40; and 0 < invalid ≤ 20 (Fatayah et al., 2020). The implementation sheets and student activity were analysed by calculating scores from observation sheets completed by observers. Observations of learning implementation were carried out over four meetings. The implementation data and student response questionnaires during the learning activities were also analyzed descriptively by calculating the percentage of responses for each question. Meanwhile, pre-test and post-test learning outcome data were analyzed using the normalized gain formula, with results interpreted according to the n-gain criteria presented in Table 1.

The formula used is the N-Gain (Normalized Gain) formula:

$$N\text{-}Gain = \frac{(\text{Post-test Score} - \text{Pre-test Score})}{(\text{Ideal Score} - \text{Pre-test Score})}$$

Table 1. ***Criteria for Categorizing Normalized Gain***

No	*Gain*	*Category*
1.	(g) ≥ 0,7	High
2.	0,3 ≤ (g) < 0,7	Medium
3.	< g > < 0,3	Low

The research development process follows the ADDIE procedure, as illustrated in Figure 1.

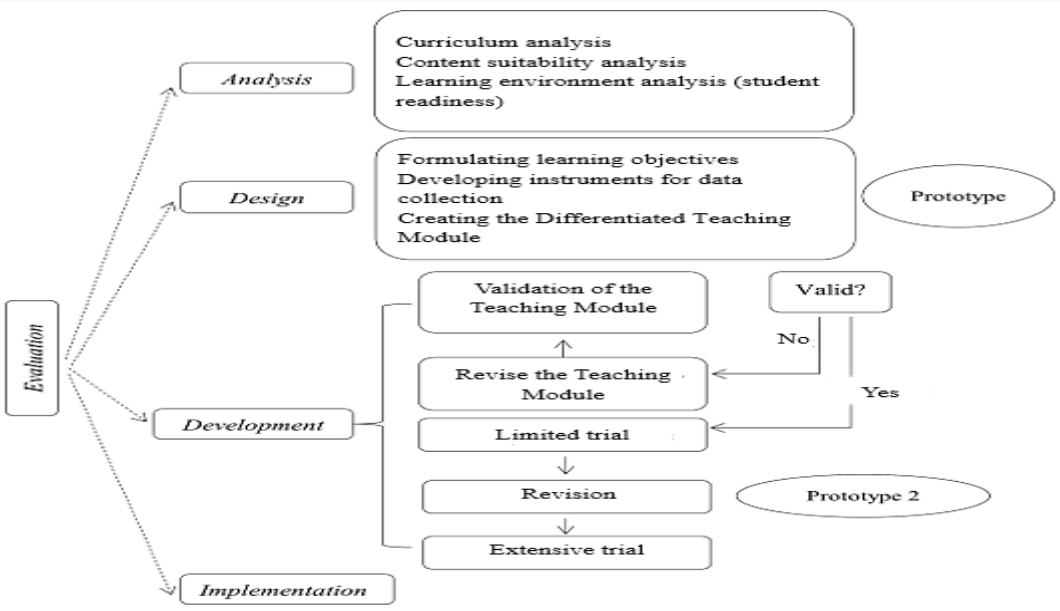

Figure 1. ADDIE Development Design

RESULTS

Module Validation Results

Instructional Module Validation

The validation results of the instructional module are presented in Figure 2.

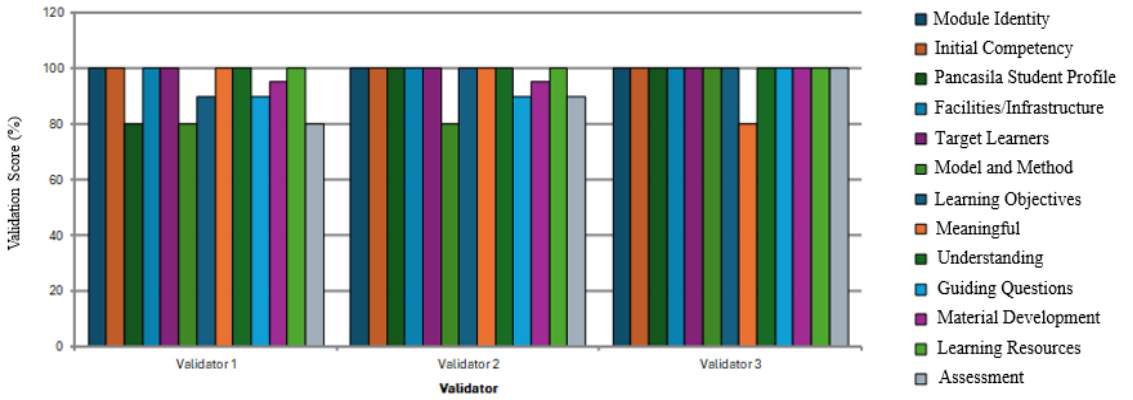

Figure 2. Validation Results for Each Indicator

The instructional module validation was assessed by calculating the average score for each indicator and aligning it with the predetermined criteria. All validators assigned scores that met the "highly valid" category criteria. A perfect score of 100 was given by Validator 1 on 7 indicators, Validator 2 on 9, and Validator 3 on 12 indicators. Validators 1 and 2 concluded that the module was valid with minor revisions, while Validator 3 deemed the module valid and ready for implementation without revisions.

Validation of Student Worksheet (LKPD)

The validation results of the LKPD are presented in Figure 3.

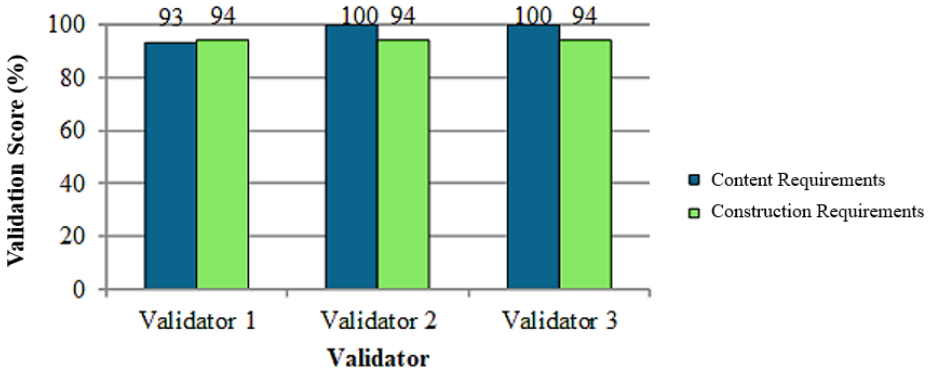

Figure 3. Validation Results of the Student Activity Sheets (LKS)

Similar to the validation process of the teaching module, the assessment of the LKS validation results was conducted by calculating the average score for each indicator and aligning it with the established criteria. The results showed that Validator 1 assigned scores of 93 for the content criterion and 94 for the construction criterion. Validators 2 and 3 gave identical scores for both criteria, with 100 for content and 94 for construction. All three validators concluded that the LKPD was valid with minor revisions and suitable for use in the study.

Validation of the Creative Thinking Test

The learning outcome test was designed to be administered as a pre-test and post-test. Validators assessed each aspect of the creative thinking test by assigning scores based on predefined evaluation criteria. The scores given by the validators for each assessment aspect are presented in Figure 4.

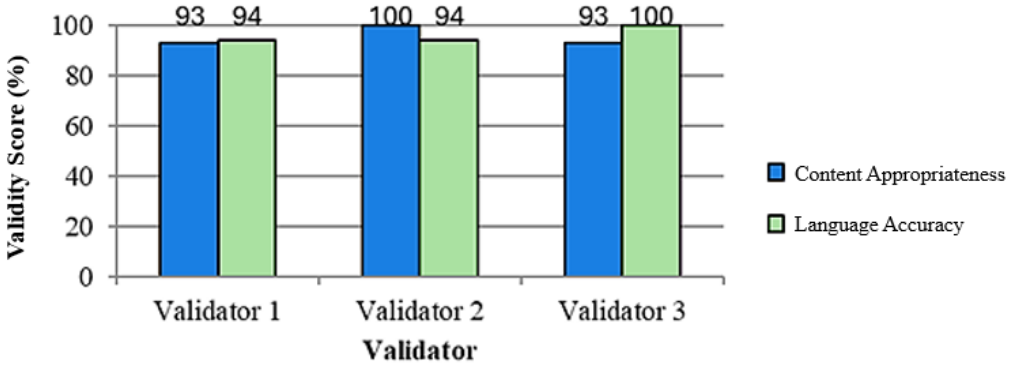

Figure 4. Validation Results of the Creative Thinking LKS

The validation scores for the creative thinking test were derived by averaging the ratings for each indicator, specifically content appropriateness and language accuracy, and then comparing them against established criteria. Validators 1 and 3 assigned a score of 93 for content appropriateness, placing it in the "very valid" category, while Validator 2 assigned a score of 100, also categorized as valid. Regarding language accuracy, Validators 1 and 2 both scored 94, and Validator 3 assigned a 100. All three validators concluded that the learning outcome test is valid, with minor revisions needed.

Practicality Test Results

Analysis Results of Teacher Activity Implementation

Table 2. Analysis Results of Teacher Activity Implementation

Session	Observer 1	Category	Observer 2	Category
1	92,5	Very Good	90	Very Good
2	95	Very Good	93,75	Very Good
3	97,5	Very Good	96,25	Very Good
4	98,75	Very Good	97,5	Very Good
Average	95,93	Very Good	94,37	Very Good

Table 2 shows that the implementation of teacher activities during sessions 1 through 4, as assessed by both observers, consistently fell into the "Very Good" category. The average score given by Observer 1 was 95.93, while Observer 2 provided an average score of 94.37.

Analysis Results of Student Activity

Table 3. Analysis Results of Student Activity

Session	Observer 1	Category	Observer 2	Category
1	90,79	Very Good	89,47	Very Good
2	93,42	Very Good	90,79	Very Good
3	96,05	Very Good	97,37	Very Good
4	97,37	Very Good	97,37	Very Good
Rata-rata	94,40	Very Good	93,75	Very Good

Table 3 indicates that student activity scores from session 1 to session 4 fell within the "Very Good" category. Observer 1 assigned an average score of 94.40, while Observer 2 gave an average of 93.75.

Student Responses

Student responses were collected through questionnaires administered after the completion of the learning process from session 1 to session 4. These responses were used to evaluate the practicality of the teaching module based on differentiated instruction. The results of the student responses are presented in Table 4.

Table 4. Percentage of Student Responses to the Learning Process

Student Response	Percentage (%)
Strongly Agree	69,82
Agree	30,18
Slightly Agree	
Disagree	-
Strongly Disagree	-

Based on Table 4, the results show that student responses to the learning process were entirely positive. The responses were collected after the completion of all learning sessions from session 1 to session 4. A total of 100% of responses fell into the positive category, with 69.82% of students selecting "Strongly Agree" and 30.18% selecting "Agree."

Effectiveness Test Results

Analysis of N-Gain

Learning outcomes were assessed using pre-test and post-test evaluations at each session. The results of the student's learning tests are presented in Table 5.

Table 5. Pre-test and Post-test Results for Each Session

Description	***Average Score***				***N-Gain***		***Category***	
	Pre-test		***Post-test***					
	7°	7B	7A	7B	7°	7B	7A	7B
Session 1	20	38	51	78	0,39	0,64	Moderate	Moderate
Session 2	26	41	56	76	0,40	0,59	Moderate	Moderate
Session 3	20	45	55	79	0,44	0,62	Moderate	Moderate
Session 4	25	45	59	84	0,45	0,71	Moderate	Moderate

Based on Table 5, the N-Gain results fall into the moderate category, indicating that the differentiated teaching module is practical. There was an improvement in both pre-test and post-test scores. In Class 7A, the N-Gain values steadily increased from session 1 to session 4, namely 0.39, 0.40, 0.44, and 0.45. Meanwhile, in Class 7B, the N-Gain value decreased in Session 2 to 0.59 from 0.64 in Session 1, though both values remain within the moderate category. Subsequently, the N-Gain increased to 0.62 in session 3 and reached 0.71 in session 4, placing it in the high category.

Analysis of Creative Thinking Ability for Each Indicator

Munandar (2016) explains that the indicators of creative thinking consist of fluency, flexibility, originality, and elaboration. The assessment results for each creative thinking indicator are presented in Figure 5.

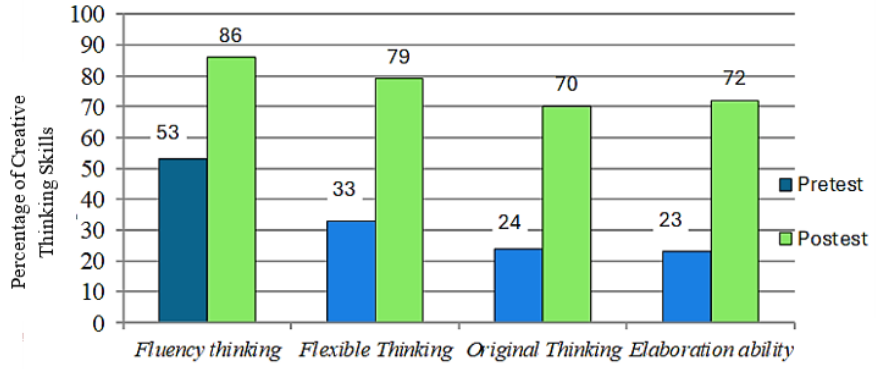

Figure 5. Results of Creative Thinking Assessment

Figure 5 shows noticeable differences in the scores obtained for each creative thinking indicator before and after implementing the differentiated teaching module. The percentage results before the intervention, ranked from highest to lowest, were fluency thinking (53%), flexible thinking (33%), original thinking (24%), and elaboration ability (23%). In the post-test, the highest to lowest scores were fluency thinking (86%), flexible thinking (79%), elaboration ability (70%), and original thinking (72%), respectively. Calculating the average increase, the greatest improvement was observed in the elaboration ability indicator.

DISCUSSION

In carrying out their daily responsibilities as educators, teachers are obligated to provide instructional administration. Among the essential components that must be prepared is the teaching module. The module developed in this study is adjusted to meet the learning needs of students and is commonly referred to as a differentiated teaching module. A high-quality instructional instrument significantly influences students' knowledge acquisition, provides clear guidance, and fosters creative thinking skills (Ati MZ et al., 2021). A teaching module can also be considered valid if it aligns with the theoretical foundations of its development and, when applied in the learning process, is capable of measuring the intended competencies. In this study, the teaching module, student worksheets, and learning outcome tests were validated by experts and practitioners.

The first validation was conducted on the teaching module. The results showed that all validators concluded the module to be valid with minor revisions. Based on the validation results, the differentiated teaching module developed in this study meets the qualifications for validity, as it includes assessments based on content and objective aspects, instructional aspects, technical aspects, and evaluations provided by the validators. The content and objectives aspect requires that all components, such as learning outcomes and instructional goals, are aligned. This is consistent with the guidelines from Suniasih (2019), who states that a teaching module is considered valid if it is developed based on a strong theoretical foundation (content validity) and demonstrates internal consistency among its components (construct validity).

The student worksheet (LKPD) validation showed that all three validators concluded it to be valid with minor revisions. This indicates that the LKPD developed is appropriate for use in the study. Apertha et al. (2018) explains that using LKPD in the learning process reinforces and supports instruction to achieve the relevant indicators and competencies outlined in the curriculum. The LKPD developed in this study aligns with the intended learning objectives and stimulates students to think creatively and express their creativity. The third validation was conducted on the learning outcome test. According to

Widoyoko (2013), a test is considered to have content validity if it can measure the competencies being developed, along with their respective indicators and learning materials. The learning outcome test developed in this study received an average score of 93, which falls into the very valid category. This indicates that the test can measure the intended competency, which is students' creative thinking skills.

The practicality of the differentiated teaching module can be observed through the implementation of student-centered learning. The implementation of each instructional syntax indicates that the teacher could effectively carry out the learning process, as reflected by implementation scores that fall into the "very high" category. This is in line with Khaerani (2020), who stated that the implementation of learning activities demonstrates the teacher's ability to carry out teaching and learning steps effectively. Student activities observed by the observers included their engagement throughout the learning process, such as participation in group work, data collection, and presentation of their observations. This indicates that student activity during the learning process was excellent. Teachers can implement differentiated instruction by modifying learning strategies in content, process, product, or learning environment, which is packaged within a structured lesson plan in the form of a differentiated teaching module. Ramadhan et al. (2023) explain that in classroom application, differentiated instruction benefits both teachers and students, as it is implemented in three stages: (1) content differentiation, (2) process, and (3) product. Student engagement increased because the differentiated instruction embedded in the module provided opportunities for collaboration and independent knowledge exploration. This aligns with Dorisno et al. (2023), who state that differentiated instruction enables in-depth exploration of concepts. Students are able to understand the material more comprehensively, allowing them to discover new relationships between concepts and generate more creative ideas.

Student responses after using the differentiated teaching module were very positive. The study's findings showed that 69.82% of students strongly agreed, and 30.18% agreed. Overall, the responses indicated a positive perception. Arfandi & Samsudin (2021) state that learning activities will be more effective when students are fully engaged in the process, the materials studied provide both theoretical and practical benefits, and students are allowed to develop their knowledge and skills.

In developing teaching modules, teachers must be able to stimulate students' creative thinking skills as part of 21st-century abilities. Isaksen, Puccio, and Treffinger (as cited in Fardah, 2012) explain that creative thinking emphasizes four aspects: fluency, flexibility, originality, and elaboration. The analysis of each creative thinking indicator showed that the highest increase occurred in elaboration. Elaboration is defined as the ability to develop, enrich, expand, or provide detailed refinement to an idea (Munandar, 2016). Based on the data obtained, only 23% of students were able to answer the question correctly during the pre-test, while this increased to 72% in the post-test. This indicates that differentiated instruction can enhance students' elaboration skills. Students are able to develop and enrich their knowledge because the teacher gives them the freedom to acquire and process information through differentiated instruction. This aligns with the view of Ardyapramesti (2023), who stated that differentiation provides a learning space tailored to each student's characteristics, such as abilities, interests, and talents.

The analysis of the learning outcome tests shows that the pre-test scores were still below the minimum criteria for achieving learning objectives. However, after the implementation of the differentiated instruction-based teaching module, students' scores increased and surpassed the

minimum achievement criteria. By the fourth session, The N-Gain scores fell into the moderate and high categories. These results indicate that the differentiated instruction-based teaching module effectively improves students' creative thinking skills. This is in line with Hasnawati and Netti's (2022) view that the use of differentiated instruction can enhance students' creativity. It allows students to improve their creative thinking skills in developing concepts and solving problems during learning. This enables them to produce high-quality learning outcomes and present their work to a broader audience.

Differentiated instruction has a significant impact on students' creative thinking, as its primary goal is to support all learners in the classroom, increase students' motivation and learning outcomes, foster positive teacher-student relationships, help students become independent learners, and enhance teachers' satisfaction in the teaching process (Marlina, 2019). Moreover, differentiated instruction serves as a solution to improve students' active participation and promote collaboration through diverse learning content (Suwartiningsih, 2021). According to Wulandari et al. (2019), overall, the differentiated instruction model offers significant opportunities to foster students' creativity by taking into account each individual's uniqueness and adjusting learning according to their specific needs. This model enables teachers to implement activities and strategies that support the development of the four key aspects of creative thinking skills: fluency, flexibility, originality, and elaboration. As a result, students are able to explore various ideas fluently, think flexibly, generate original thoughts, and elaborate on these ideas in a detailed and structured manner, leading to the creation of meaningful and outstanding work.

Based on the findings of a study by Ellya, Ramdhan, and Ratnasari (2021), students' creativity and innovation skills can be developed through various means, including the use of instructional models and learning media that align with students' characteristics and contemporary developments. Therefore, a differentiated instruction design has the potential to stimulate the development of students' creativity and innovation, enabling them to discover new and original ideas. This is consistent with the analysis conducted in both the limited and extended trial classes, which demonstrated that implementing differentiated instruction can effectively enhance students' creative skills. This is in line with the findings of Husnawati (2022), which indicate that implementing differentiated instruction can improve students' learning creativity. The implementation of this approach enables students to think critically, formulate and solve problems, and demonstrate emotional sensitivity in communication and collaboration. As a result, they can produce high-quality work and confidently present their projects in front of the class.

CONCLUSION

The results of this study indicate that the development of a differentiated instruction-based teaching module meets the requirements for validity, effectiveness, and practicality. The module is considered valid and suitable for use in teaching Ecosystem-related content. Validation results from three expert validators showed that the teaching module, student worksheets (LKPD), and learning outcome tests fall under the category of highly valid. The module also meets the criteria for practicality, making it feasible to implement in classroom instruction. This is supported by observations of learning implementation, which were rated highly practical and positive student responses toward the learning experience. In terms of effectiveness, the N-gain scores fall into the medium and high categories, indicating that the module effectively enhances student learning outcomes.

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