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The Effectiveness of Digitalization Development of IPAS Textbooks Based on Higher Order Thinking Skills in Independent Curriculum

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ABSTRACT

Objective: *This study aims to describe the effectiveness of developing HOTS-based science and natural science textbooks in digital format within the framework of the Independent Curriculum. The Independent Curriculum provides teachers with the flexibility to design a curriculum according to the specific conditions or needs of their schools.* ***Method***: *This study used the ADDIE model as the instructional design research method. The science and natural science textbooks developed in this study follow the ADDIE model, which includes the analysis stage, design stage, development stage, implementation stage, and evaluation stage.* ***Results***: *The results of the study include validation and trial outcomes. The validation results of the science and natural science textbooks show an average score of 3.9, categorized as very feasible. Individual and group trials yielded average scores of 85.6 and 87, respectively, indicating the textbooks are very feasible for use based on HOTS criteria. The actual implementation of the textbooks resulted in an average score of 86.1, also classified as very feasible.* ***Novelty***: *novelty in this study is the development of science and natural science textbooks that are equipped with higher-order thinking (HOTS) questions and presented in digital format. This provides convenience for both teachers and students in accessing as a reference in learning.*

INTRODUCTION

Education is a sector that continues to grow along with technological developments, especially in today's digital era. One of the significant aspects of the educational process is the use of teaching materials. The use of relevant and effective teaching materials is the main key in creating an optimal learning environment. In the digital age, the development of educational resources has become an urgent necessity to keep pace with the times. Consequently, the role of teachers has also shifted with technological progress. Within the confront of these challenges, it is imperative for instructive teach to invest resources in preparing within the improvement of educating materials within the advanced time. Teachers urgently need to have sufficient skills to create and manage digital teaching materials effectively in accordance with the curriculum targeted by the Government, namely the Independent Curriculum.

The Merdeka Curriculum is a refinement of the 2013 curriculum is designed to improve the quality of learning that is relevant to meet the interests, needs, and characteristics of students. This curriculum is more flexible because it is more tailored to the conditions and needs of students at various conditions. This independent or flexible curriculum emphasizes essential materials and improving students' character and competence (Tunas & Pangkey, 2024). The independent curriculum has several advantages over the previous curriculum, including: (1) more focused and simple, the

existence of this curriculum makes students focus more on essential materials and competency development. (2) Much more independent, that is, more independent in terms of learning. This curriculum frees students to select subjects concurring to their interface, abilities, and desires. (3) More interactive, the free educational programs are additionally considered more pertinent and intelligently (Fauzi, 2022).

Textbooks are one of the most important learning tools to achieve learning goals. Through textbooks, students can obtain information about the material being taught. Textbooks are arranged according to the learning plan and learning needs for students or students. Textbooks are designed to achieve certain learning goals or competencies. Natural and Social Sciences or IPAS could be a combination of Common Sciences (IPA) and Social Sciences (IPS) subjects. Social Science learning aims to cultivate scientific, analytical reasoning, and creative attitudes in students at the elementary/MI level who have used the self-directed curriculum. The combination these two subjects is performed out because this knowledge at elementary/MI students is still in the simple stage, so that the discussion of material in the science subject is still about general natural phenomena such as living things and inanimate objects in nature and related to human life as social creatures (Lestari et al., 2023).

The characteristics of Natural and Social Sciences (IPAS) learning are dynamic and continuously evolving over time. As a result, Social Science education must adapt to these changes to remain relevant, enabling students to understand and respond to current and future challenges (Suhelayanti et al., 2023). IPAS is expected to be able to develop scientific attitudes in students, including high curiosity, analysis, critical thinking, objectivity, systematic, responsible, decision-making, and the ability to design correctly (A. Fanani et al., 2022). Social Science learning also helps students grow their curiosity about knowledge of phenomena that occur around them (Sugih *et al*., 2023). Higher Arrange Considering Aptitudes (HOTS) could be a thought handle for understudies at the next cognitive level, specifically problem-solving abilities, imaginative considering aptitudes, basic considering, argumentative skills, and decision-making skills (Herman et al., 2022). The character of high-level thinking questions is usually used in TIMSS and PISA questions that require thinking and problem-solving abilities can be utilized as a apparatus to see the degree of students' capacities and can discover out whether understudies are classified as Higher Arrange Considering or Moo Arrange Considering. The questions displayed in TIMSS and PISA are the sorts of questions that will offer assistance understudies create their capacity to think basically, coherently, metacognitively.

RESEARCH METHOD

Research Design

This study used an investigation and development study. A development research method is used to create a specific product. In this case, the product developed is a printed module for entrepreneurship courses. The model used for development is the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. The ADDIE learning system design model with its components are illustrated in Figure 1.

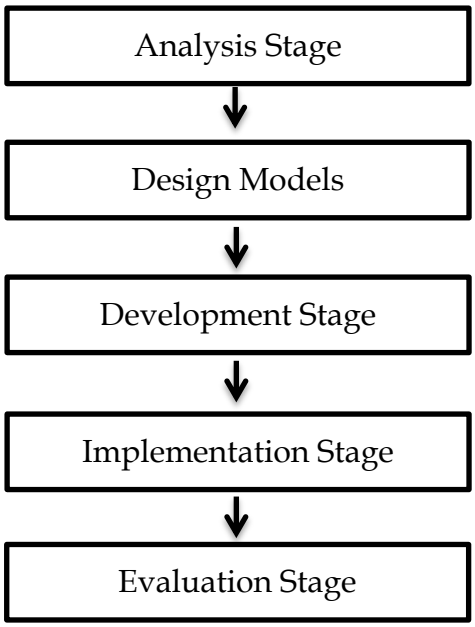

Figure 1. ADDIE Development Model

- Analysis Stage; The analysis phase is the first step where the researcher conducts a needs analysis, namely conducting interviews and questionnaires with MI Roudlotut Tholibin students regarding the textbooks used while at school to improve high-level thinking skills.
- Design model; The design model phase is the second step of the ADDIE method which includes setting goals, learning materials. It is determined that a HOTS-based science subject book for grade V SD/MI will be developed.
- Development Stage; In the development stage, the HOTS-based science textbook is created and then subjected to validation testing. The validation process is conducted by two expert validators. Once validated, the product is tested both individually and in groups.
- Implementation; This stage involves the actual implementation of the developed HOTS-based textbook in a real classroom setting. The textbook is used according to the planned learning process. After implementation, an initial evaluation is conducted to gather feedback for further development of the IPAS textbook.
- Evaluation; The evaluation stage is the final step in the ADDIE development model. This stage involves distributing surveys to students to assess their responses and perceptions of the developed learning module.

Data Analysis

There were two types of research data that are classified based on their nature, namely qualitative and quantitative data. Qualitative information presented as inputs, suggestions, comments on the developed modules. Meanwhile, quantitative data is in the form of observation sheet data given to validators, material experts, media/design experts. Quantitative information was moreover gotten from the comes about of module trial surveys on little and medium scales. Validators, material experts, design

experts, and respondents fill out validation sheets according to the standards outlined in Table 1.

Table 1. Validation Sheet Item Assessment Criteria

No	Category	Score
1	Excellent	4
2	Good	3
3	Less	2
4	Very Less	1

The equation utilized to calculate the rate of each subject is as takes after:

$$P = \frac{\sum x}{\sum xi} x\ 100\% \quad (1)$$

Information:
P = Percentage searched x = Total Scorex_i = Maximum Score

To give meaning and decision-making from the score of the calculation results that have been obtained above, the score can be interpreted with a range as in the Table 2.

Table 2. Respondent Questionnaire Score Criteria

Percentage	Criterion
85- 100%	Excellent
69 – 84%	Good
53 – 68%	Enough
37 – 52%	Less
21 – 36%	Very Less

RESULTS AND DISCUSSION

Results

The HOTS-based IPAS textbook is equipped with high-level thinking questions. The IPAS books were developed using the ADDIE model, which includes the analysis stage, design stage, development stage, implementation stage, and evaluation stage. The results of the development of the HOTS-based reading materials are as follows:

1. Analysis Stage

   At this step, researcher carried out an initial analysis in the form of interviews and observations. Interviews and observations were conducted at MI Roudlotut Tholibin school, Bulusan Village, Kalipuro District, Banyuwangi. The observations made revealed a fact that the textbooks used during learning by teachers at the school were only books published by the Indonesian Republic's Ministry of Education and Culture. The school has also never had a special book that leads to HOTS. At that point the meet conducted with the educator of course V was found that the high-level considering capacity of review V understudies was moo, which was still limited at the C2 level. This is characterized by the inability of students to solve science problems at the analysis level.

2. Design Models

At this arrange, the analyst carried out a few steps, specifically media choice, format selection, instrument preparation and product realization. The researcher's activities at this stage realize the concept into a full-fledged HOTS-based science textbook https://drive.google.com/file/d/1C1KA9GiLxcD9IEG0UB9bPgbZAuKdphk6/view?usp=sharing. Textbooks equipped with high-level thinking skills have been developed as Figure 2.

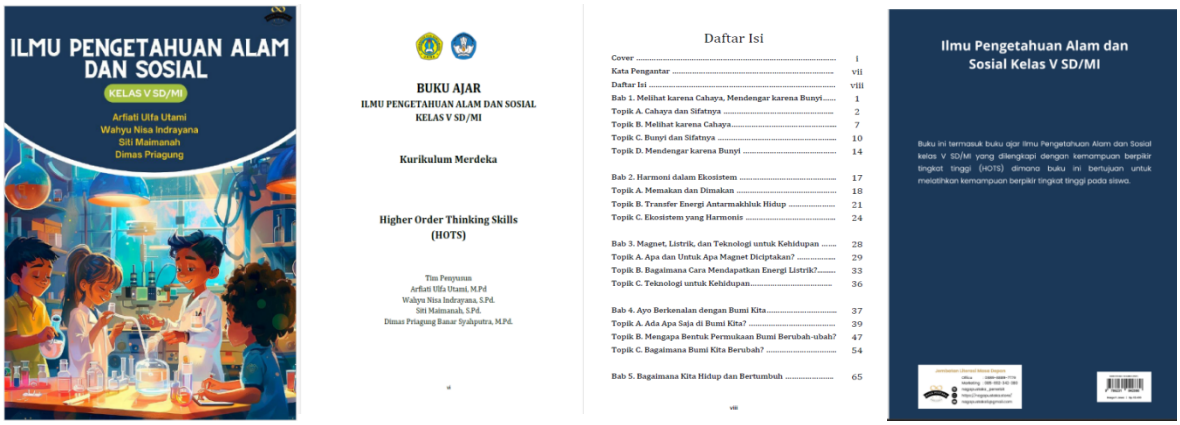

Figure 2. Science Textbook for Grade V

3. Development Stage

At this stage the product will undergo the validation phase for product testing. This phase intends to determine the validity or practicality of the product through expert evaluation. The evaluation was conducted by summarizing the validation outcomes from specialists. The summary of the validation results for the HOTS-based IPAS textbook is presented in Table 3. Based on the results of the validation of the IPAS textbook above, the average results from validators 1 and 2 were obtained with an average result of 3.9 and it can be concluded that the HOTS-based IPAS textbook is very feasible to use. The validated textbooks are tested on students. Product testing consists of individual and group trials. In the individual and group trial stages, the first stage is an individual trial by filling out a questionnaire to 3 students, then followed by a group trial, which is testing the feasibility of all samples or students as many as 20 students of class V MI Roudlotut Tholibin Bulusan Village, Kalipuro District. The following ebooks are uploaded on digital platform so that students and teachers can access them.

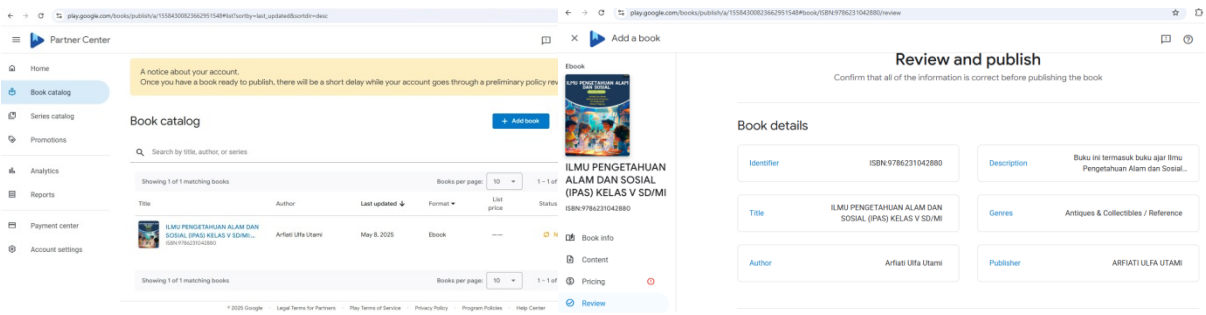

Figure 3. Textbook on the Google Play Book Platform

Based on the image 3 above, the science textbook can be accessed easily. So digital technology will make it easier for students. At this stage, it is carried out by giving a questionnaire to grade V students. The following is student data on individual tests and group tests. The outcomes of the trial completing the student feedback survey are as follows. This individual trial was carried out by grade V students comprising a total of 3 students. The results of individual trials can be found in Table 4.

Table 3. Outcomes of the Validation of Social Science Textbooks Based on HOTS

No	Dimension	Average	Category
1	Contents of IPAS HOTS Textbook	3,75	very feasible
2	Language	4,00	very feasible
3	Display	4,00	very feasible
	Average	3,9	very feasible

Table 4. The Individual Trial Results

No	Students Name	Class	Score	Presentation
1	Average Students	V	85,6	85,6%

According to the outcomes of separate experiments, It is evident that the IPAS textbook created by the analyst received a positive response and obtained an assessment result of 85.6% with the category of being very suitable as a textbook in the science subject of elementary school grade V. This group trial was carried out by class V students with a total of 20 students of MI Roudlotut Tholibin Bulusan Kalipuro District. In the table 5 are the results of a large group trial.

Table 5. The Group Trial Results

No	Students Name	Class	Score	Presentation
1	Average Students	V	87	87%

Based on the comes about of the gather trial, it can be seen that the IPAS reading material created by the analyst received positive response and received an assessment result of 87% with the category of being very suitable as a textbook in the science subject of elementary school class V.

4. Implementation Phase

The execution organize may be a arrange to actualize the comes about of HOTS-based IPAS course reading items that have been created in genuine circumstances within the classroom. The course reading fabric that has been created is delivered in agreement with the learning. After it is actualized within the shape of learning exercises, an starting assessment is carried out to supply input on the usage of course reading improvement. The taking after are the comes about of the usage of reading material items as Table 6.

Table 6. The Real Results

No	Student Name	Class	Score	Presentation

1	Average Students	V	86,1	86,1%

5. Evaluation Stage

Based on the development of IPAS textbooks that have been piloted on individuals and groups, very decent results have been obtained. It can be said that the IPAS textbook is suitable to be used as a supporting book in learning. The execution phase took place in an actual classroom with 20 students, the results were very decent based on student responses. The development of HOT-based IPAS textbooks can be said to be effective if it meets the feasibility aspects of HOTS textbook content, language, and display. In addition, textbooks are also effective in helping students understand social studies materials well. This is evidenced by good student responses, because the HOTS textbook can attract students' interest in learning and supply resources that align with and are pertinent to the Independent Curriculum. According Firdausy *et.al*. (2024), the advancement of reading material is vital in a learning prepare since it may be a figure that can progress the quality of learning. The advancement of course readings will make innovative and curiously learning so that understudies don't feel bored amid learning exercises. In expansion, the improvement of a locks in reading material will make students more dynamic and inquisitive about learning the fabric within the reading material. According to the journal Devirita et. al. (2021), based on the comes about of the test of the viability of students' exercises amid the learning handle, an average of 89.6% was obtained. Observation of students' attitudes during learning shows that the cultivation of character values is at the stage of starting to cultivate.

Discussion

A study on the creation of textbooks focused on HOTS development was conducted by Qoridatullah et al. (2021), reveal that the development of HOTS-based teaching materials is essential due to societal changes and the evolving demands of the times. The study concluded that HOTS-based teaching materials are effective options for fostering students' high-level thinking abilities. Based on the issues outlined above, the development of teaching materials, particularly in science subjects, is necessary. The development of HOTS-based science textbooks followed the 4D model research procedure (Qoridatullah et al., 2021).

The results showed that material experts gave an average score of 87%, indicating a "very good" predicate. Media experts provided an average score of 79%, categorized as "good," while teacher responses averaged 80%, also falling under the "good" category. The effectiveness of the textbooks was further demonstrated through student responses and learning outcome completeness, which reached 92%, a significant increase compared to the 33% before using the textbooks. Based on student responses and learning outcomes, it can be concluded that the HOTS-based science textbook on ecosystems is effective in enhancing higher-order thinking skills in Grade V SD/MI students.

Teaching materials are a common term utilized to portray the learning assets that instructors utilize to convey learning. Instructing materials can back the learning handle and increment understudy victory. Science learning that is supported by technology, including the use of visuals, will be more effective than learning that uses conventional

classrooms. This will encourage students' interest in science learning and increase real and concrete knowledge (Astuti et al., 2023). Computerized innovation has brought noteworthy changes in science instruction, both in terms of learning strategies, substance, and foundation utilized. The utilize of computerized innovation permits understudies to memorize autonomously and ceaselessly, encourages interaction between understudies and instructors, and gives simpler get to more changed learning assets. In the 2013 Curriculum, science learning for elementary schools is still simple (Wibisari & Mulyani, 2023). Sukmana et al. (2022) shows that the material in e-book instructing materials based on a logical approach in science learning features an exceptionally great category or capability and is reasonable for utilize in learning. Digital teaching materials allow students to learn anywhere and anytime, providing greater flexibility in the learning process. However, there are some concerns that arise, such as the gap in access to technology among students, the lack of oversight of the content consumed, and the potential disruption to students' learning focus due to their propensity towards digital devices (Anita et al., 2022). The main advantage of digital teaching materials is that they are able to facilitate distance or online learning, which is becoming increasingly important in situations such as the global pandemic that limits physical access to the classroom (Putra et al., 2023).

According to Prihanti et al. (2023), investigate on the advancement of advanced educating materials based on Taman Siswa lessons conducted utilizing the Canva application has been effectively created . The effectiveness of this teaching material received positive feedback during its use. Therefore, these educational materials can be viewed as an extremely valuable asset in a comprehensive learning experience. The world of education has become attached to technology so that it has a significant impact, the teaching process that utilizes technology makes teaching more innovative (Ambarwati et al., 2021). Natural Science learning is learning that requires strong reasoning by a student. Science learning aims to develop students' potential through providing experience by understanding the environment scientifically (Tuah et al., 2023). According to research by Arini & Sudatha (2022), the creation of educational resources for teaching social studies content with a heutagogy approach based on the local wisdom of the Balinese Subak system in grade V elementary school using the ADDIE development model has produced teaching material products that are valid, practical, and effectively applied in the learning process as an effort to simplify the content for students to grasp the material better, enhance the effectiveness of student learning results.

HOTS is a thinking process for students that engages them at an advanced cognitive level by combining different cognitive approaches beginning with reasoning, critical in processing information, drawing conclusions and making decisions, and being creative to make various strategies in solving problems (Herman et al., 2022). Fanani et al (2018) in their research stated that high-level thinking skills can enhance student learning results because they can enhance critical and creative thinking skills. HOTS appraisal can move forward learning results so that understudies are able to compete on the national and universal arrange. Students must be stimulated to come up with creative and innovative ideas and be capable of applying them in daily life (Jaenudin et al, 2020). HOTS is getting more attention from the government and is a target for the government. The learning targets that are focused on are communication, collaboration,

basic considering, and issue fathoming, imagination and development (Novia et al, 2024). According to Sani 2019, HOTS can plan the more youthful era to sharpen their basic, inventive and gifted considering aptitudes in making choices to fathom issues (Salong, 2021).

According to research by Sulistiana (2022), project-based learning can grow HOTS in both children and adults. In the execution of the Independent Curriculum, very important ability for students to possess is the HOTS ability (Rindayati et al., 2022). This is because HOTS capabilities are essential in 21st century education. Ummami et al (2021) states High-level thinking skills, or HOTS, refer to the methods or techniques employed by students to utilize their ability to analyze, plan, design, implement, and assess all current problems. HOTS ability can be owned and improved by students through the training process. The exercise was obtained from all learning activities and could be measured through HOTS-based question assessments (Handayani et.al, 2023). Higher Order Thinking Skills (HOTS) are inseparable from thinking critically about a problem faced, thinking creatively to achieve a goal, having the ability to solve a problem faced and make the right decision. The primary objective of Higher Order Thinking Skills is to enhance students' thinking abilities at an elevated level, particularly concerning critical thinking when processing information, creative thinking for resolving problems using their knowledge, and decision-making in intricate scenarios (Kurniasih et al., 2020). HOTS is part of both creative thinking skills and critical thinking skills (Suparman et al., 2021). Advanced cognitive skills also refer to the capability to resolve issues (Yusti et al., 2021). The primary objective of HOTS is to enhance students' thinking abilities at an elevated level, particularly concerning their capacity for critical thinking when processing different kinds of information, employing creativity to resolve problems using their knowledge, and making decisions in intricate scenarios. Each Students with the ability to process the learning materials that have been learned will have an impact on increasing higher-order thinking skills (HOTS) and students' learning completeness will also increase (Nurhabiba & Misdalina, 2023). Outcome of this research that has been conducted regarding the analysis of Higher Order Thinking Skills (HOTS) of students in solving mathematical HOTS problems on the subject of building space in students of Zainul Hasan 1 Genggong Junior High School can be concluded that HOTS students with high abilities are able to meet the indicators of analyzing, evaluating, and creating. HOTS students with average ability can fulfill the criteria for analyzing and evaluating, but have not yet reached the criteria for creating. HOTS students with lower abilities can fulfill the criteria for analyzing but are unable to meet the standards for evaluating and creating. (Maliq et al., 2022).

According to Andhani et al. (2023), The study's outcomes produced a digital tool designed to assess critical thinking abilities, which has undergone feasibility testing and met valid standards. According to Rumadan, 2023 The planning phase is conducted to create a preliminary outline of the product. An item is considered empirically valid if it satisfies four criteria related to the empirical validity of the item, the reliability of the test, the question's difficulty level, and the item’s ability to distinguish between different respondents (Alfiyah et.al., 2023). Assessment phase, conducted on the developed product in the format of content/learning media materials that are created and assessing the efficacy and success of the media produced (Panggabean et.al., 2022). Therefore, This research seeks to outline and examine the use of the SETS and HOTS

methods in enhancing Indonesian students' critical thinking abilities through literature studies (Rahmawati et al., 2022).

The research conducted by Sepriyanti et al. (2022) found that the competency-based learning approach aligned with 21st-century education is highly effective in enhancing Higher-Order Thinking Skills (HOTS) and numerical literacy among students at public Islamic universities in Indonesia, with an effectiveness score of 81.67%. Student responses to the learning process were also notably positive (81.78%). The results of the HOTS and numerical literacy assessments revealed that male students demonstrated higher HOTS, while female students showed superior numerical literacy skills after receiving instruction focused on 21st-century competencies. Gender was found to have a partial and weak correlation with students' HOTS and numerical literacy outcomes across the nine universities. HOTS is a critical skill set for 21st-century learners, enabling them to effectively analyze, evaluate, and create solutions to various future challenges (Widyawati et al., 2018).

CONCLUSION

Fundamental Finding: (1) The developed Science textbook is effective in enhancing high-level thinking skills among Grade V SD/MI students, (2) Validation results show an average score of 3.9, indicating a highly feasible category, (3) Individual and group trials yielded average scores of 85.6 and 87, respectively, placing the textbook in a very feasible category for HOTS-based materials, (4) The actual implementation achieved an average score of 86.1, categorizing it as highly attainable. **Implication**: (1) HOTS-based digital Science textbooks facilitate easier access for students and teachers, (2) These digital resources help students become accustomed to higher-order thinking, (3) The use of such textbooks positively influences students' learning motivation. **Limitation**: (1) The study is limited to the development of science textbooks for Grade V, (2) Student engagement during product trials was relatively low. **Future Research**: (1) Further development of HOTS-based digital Science textbooks for junior high school levels, (2) Expansion of development to include other subject areas.

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