Development of Teaching Materials Based on Team Based Project Integrated With Digital Technology In The Course of Teaching And Learning Strategies of Elementary School Teacher Education Study Progam State University of Medan

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Abstract. This study aims to develop teaching materials based on Team Based Project (TBP) integrated with digital technology in the Teaching and Learning Strategy course in the Elementary School Teacher Education Study Program, State University. The main objective of this study is to improve students' skills and understanding in developing effective and interactive teaching and learning strategies through the TBP method. This research method uses the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model to develop teaching materials integrated with digital technology. The implementation of this study uses various applications to support the development of technology-based teaching materials containing multimedia such as video, animation, text, and images. These teaching materials are designed to facilitate interactive discussions between students and improve students' cognitive abilities and skills in completing assigned projects. This study also involves validation by material experts, as well as limited trials on students. The study's findings show that instructional materials based on Team Based Projects combined with digital technology are both highly appropriate for use as teaching materials (as indicated by the study's 3.8 results) and effective for use in learning (as indicated by the N-gain calculation's 0.70 value, which falls within the high/very effective criteria). The results of this study also show the practicality of teaching materials, which is 3.5 which is in the high criteria. As a result, this study can help the State University Elementary School Teacher Education Study Program create a more engaging and successful learning environment. It can also serve as a model for creating other instructional materials that incorporate digital technology and team-based projects.

Keywords: Team Based Project, Digital Technology, Teaching and Learning Strategies

1 Introduction

The Elementary School Teacher Education Department strives to improve and develop itself in order to keep up with technological developments. In line with the general policy of the

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Ministry of Education, Culture, Research, and Technology, this program is intended to encourage the realization of quality higher education, managed autonomously in a healthy organizational environment, so as to produce college graduates who are true learners who are competent, flexible and persistent (agile learners), ready to contribute positively to national development and become productive world citizens. The program provided by the government to facilitate, encourage, and accelerate higher education is by achieving the eight Main Performance Indicators (IKU) that have been set. To realize competent higher education, theoretical and practical courses are provided.

To achieve this, learning activities must be achieved as soon as possible by using the Team Based Project (TBP) learning method integrated with Digital Technology. This learning system is oriented towards active learning methods through the use of small groups both in and outside the classroom with integrated smart technology (Digital Technology). The Team-Based Project method can be used by students to solve problems and develop student competencies. According to Wijaya, et al. (2021: 2) outlined how this approach is thought to be able to motivate students to investigate, evaluate, analyze, and synthesize data in order to provide a variety of learning outcomes that are highly suitable for the features of practical courses.

Digital Technology is a tool used in integrated learning websites that contain learning including digital content, digital media, and others to add information related to the ongoing material. According to Nurlela, Neng (2021: 1629) explained that technological assistance is a component that can help human work, making it easier for humans to carry out tasks in everyday life. Thus, the Team Based Project (TBP) learning method integrated with Digital Technology can be used to renew learning at the tertiary level. Different from traditional learning methods where the topics taught are determined by the lecturer and then from this topic the output will be identified.

Medan State University is one of the universities that implements the Team Based Project (TBP) learning method which can change learning from the perspective of critical thinking patterns of students and lecturers and can solve problems. This method has been recommended in the KKNI curriculum, namely the National Qualification Framework. The KKNI curriculum is a curriculum that produces human resources who achieve learning outcomes and are ready for the world of work.

Teaching and learning strategies are one of the theoretical and practical courses in the Elementary School Teacher Education (PGSD) department which plays an important role in developing student teaching. Fatimah, et al. (2018: 109) learning strategies are the main factor in improving the language learning process and language skills. This illustrates that the teaching and learning strategy course will affect students' competence and skills in teaching in the future.

The development of teaching materials in the teaching and learning strategy course is considered very important to do, based on research that found that with the existence of learning and learning strategies, it is hoped that the language learning and learning process can be carried out well (Fatimah, et al. (2018: 108). The development of teaching materials also needs to be adjusted to the learning methods implemented in the Elementary School Teacher Education department.

The purpose of this study was to measure the feasibility, effectiveness and practicality of teaching material products designed and implemented in the teaching and learning strategy course in the Elementary School Teacher Education Study Program (PGSD) Faculty of Education (FIP) State University of Medan. This study is expected that lecturers at the State University of Medan will be able to implement team-based projects in learning based on digital technology.

This research has contributed in an effort to design new teaching materials as a product of developing the concept of teaching and learning strategy courses as one of the solutions in achieving the curriculum set by the Faculty of Education, Elementary School Teacher Education Study Program to be able to improve institutional quality in international accreditation. The results of the study can also contribute as a rule model for developing lecture devices and integrated digital technology team-based project methods at the State University of Medan which is an implementation of the MBKM curriculum achievements.

Team-based projects are a strategy to provide students with challenges related to everyday life that are built on learning activities and project-based assignments in real life and completed in groups. Effective strategies, according to Sunardi & Hasanuddin (2019), can promote student involvement, foster creativity, innovation, and meaning, aid in problem-solving in daily life, develop knowledge and skills, manipulate, design, use, and manage technology, apply knowledge and abilities in combining knowledge and skills, and foster curiosity, all of which foster creativity, imaginative thinking, and critical thinking.

The learning method at the State University of Medan currently applies the team-based project learning method which refers to the method used and the impact of the method on students, teaching materials will be developed based on team-based projects. Digital technology is a gadget that can connect to any computer and is typically an automated system that operates without the need for human intervention. Because digital technology can transmit information quickly and create a virtual public, it also brings with it a number of variables related to awareness of digital use, including societal change. Smartphones and the internet are only two examples of the many digital technologies that people use today. As digital technology advances, users can easily obtain a variety of information about online payments.

The availability of digital technology will facilitate communication and speedy information searches for all. Communication and information are said to be the influence of technological developments. According to Nurillahwaty (2022: 82) all the advantages of current technology can provide fast and unlimited access to information, making learning materials available to students. One of the digital technologies facilitated in this study includes mentimeter and youtube as a means of supporting tools in the teaching process.

Digital technology can facilitate educators in the learning process which can be used as a learning medium, or a means of learning. This is supported by research by Maritsa, et al. (2021: 92) that technology is a supporting tool used in education to make it easier for teachers to teach students with the desired results. Educators can use technology as a learning medium or facilitator to convey knowledge to students through various applications or the web.

The course on teaching and learning strategies focuses on the activities teachers do to help students meet their learning milestones. In order to facilitate the teaching and learning process and ensure that the data yields the best possible results, it is imperative that learning strategies be used. The teaching and learning process is undirected in the absence of a specific strategy, making it challenging to meet the established learning objectives as best as possible. Teachers can utilize strategies as methodical guidelines and references while applying learning, according to Hardini et al. (2012: 212). It can help pupils study more efficiently. Meanwhile, according to Etin Solihatin (2012: 4), teaching and learning strategies are a comprehensive approach in a learning system, in the form of general guidelines and activity frameworks to achieve general learning objectives, which describe systematic procedures in assisting students' learning efforts, organizing learning experiences, organizing and planning teaching materials to achieve certain learning objectives. In order for learning to occur successfully and efficiently in the classroom, teaching and learning procedures make use of a variety of learning resources that teachers utilize, such as teaching aids, textbooks, and index cards.

In the teaching and learning strategy course in Elementary School Teacher Education at the State University of Medan, instructional materials based on team-based projects combined with digital technology will be developed in four stages, specifically:

a. Designing sub-CPMK and learning outcomes in the teaching and learning strategy course,
b. Developing teaching materials based on team-based projects integrated with digital technology that will be developed.
c. Putting goods into practice created for the teaching and learning strategy course's students.
d. Evaluation of learning materials based on team-based projects integrated with digital technology that have been implemented previously.

Team-based projects integrated with digital technology are a concept built in the development of teaching materials for problem solving in the teaching and learning strategy course in obtaining students' abilities in developing their creativity and knowledge according to IKU-7.

Initial research activities carried out to survey the implementation and understanding of lecturers regarding team-based projects, especially in the Faculty of Education, State University of Medan, presented by the team of Prof. Dr. Dian Armanto, M.Pd., M.A., M.Sc., Ph.D accompanied by the Vice Dean I for Academic Affairs to obtain initial data in this study. Based on this explanation, it can be concluded that the implementation of team-based projects will be integrated with digital technology in the teaching and learning strategy course in the Faculty of Education, State University of Medan, special actions need to be taken in an effort to maximize the learning methods that can be developed.

2 Research Method

The research and development (R&D) method is used in the research design for the creation of instructional materials based on integrated digital technology team-based projects in the teaching and learning strategy course at the State University of Medan's Elementary School Teacher Education Study Program. Research that necessitates the creation of a product through the ideation and execution of new product concepts or enhancements to current products is known as research and development (R&D) research (Winaryati et al., 2021).

The Analysis, Design, Development, Implementation, and Evaluation (ADDIE) type of design and development study is the main focus of this research process. According to Winaryati, et al (2021: 25) explain that each stage of ADDIE has details of activities that are evaluated according to the desired objectives, demands, and future hopes. The study of the ADDIE method development procedure uses 5 stages, namely (1) the analysis phase, which comprises skills analysis, goal identification, and data on research needs; (2) the design phase, which entails creating the goals, test questions, and execution plans; (3) development stage which includes: creating and compiling materials according to the design or storyboard that has been made at the design stage and testing the product that has been developed; (4) implementation stage which includes: implementing the product that has been developed in a wider scope according to the research sample and the final result of the implementation stage is the occurrence of an effective learning process both inside and outside the classroom; (5) evaluation stage which includes reflecting and revising what has been done starting from the analysis, design,

development and implementation stages. If there are several things that need to be fixed, then they need to be identified and then perfected.

3 Results and Discussion

The results of this study are a product of teaching materials based on team-based projects integrated with digital technology in the teaching and learning strategy course with the inclusion of feasible/valid, practical and effective products. The products produced are teaching materials. Teaching materials based on team-based projects integrated with digital technology in the teaching and learning strategy course produced have gone through a product validity/feasibility test by experts and practitioners who are competent in the field of pedagogy and educational technology by assessing theoretical rationales with the components of the teaching materials.

3.1 Potential Problem Analysis

This initial stage begins with the analysis of potential problems, identification of objectives, and analysis of skills. The problems found based on initial observations are that the teaching and learning strategy course has not implemented the team-based project method involving technology-based learning. In order to implement MBKM IKU 7 with the results of research on instructional materials and learning devices that support research, integrated digital technology team-based project learning must be implemented in the teaching and learning strategy course. This is due to the potential and issues identified.

The learning results of the students are divided into five categories: very low, low, medium, high, and very high. Table 1 below displays the learning outcome, which is as follows:

Table 1. Level of Student Learning Outcomes in the Teaching and Learning Strategy Course Academic Year 2023/2024

No	Interval	Score Level	Number of Students
1	80 - 100	A	120
2	75 - 84	B	120
3	65 - 74	C	10
Total			**250**

Information:
A = Very Good
B = Good
C = Fairly Good

As demonstrated in Figure 1, the following figure shows scores according to the degree of student learning outcome categories in the teaching and learning strategies course:

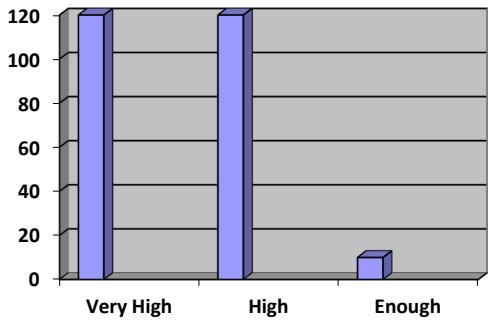


Fig. 1. Diagram of Learning Outcome Category Levels for the Teaching and Learning Strategy Course for the 2023/2024 Academic Year

The data in Figure 4 shows that there are 120 students who get grades in category A (very good), 120 students get grades in category B (good) and 10 students get grades in category C (sufficient). Considering the learning objectives of the teaching and learning strategies course for the 2023/2024 academic year, it can be said that teaching and learning strategies have been well implemented in Elementary School Teacher Education at Medan State University, but there are 10 students who need guidance in this course.

Based on the analysis of potential problems found, the learning outcomes of students in the teaching and learning strategy course for the 2023/2024 academic year are on average in the high category, but there are some students who are still in the sufficient category. In addition, the results of the interview data obtained in the initial analysis, the teaching and learning strategy course has not implemented the team-based project method integrated with technology.

Identification of the expected objectives of lecturers is able to implement technology in the teaching and learning strategy course by involving the team-based project method, and it is expected that the output produced can be used by students as well as possible by looking at the efficacy of the manufactured goods and the products are suitable for use in the learning process. The skills expected in this study are that lecturers are skilled in utilizing technology during learning..

3.2 Design

This activity is carried out to create a strategy in providing the right solution to solve the problems found in the analysis of potential problems. The problem solutions are designed in accordance with the reality in the research. In this activity, initial design planning is carried out on the learning materials developed.

The design stages carried out by researchers are by making an initial design of teaching materials based on team-based projects integrated with digital technology. The following is a picture of 2 conceptual frameworks of teaching materials developed in this study:

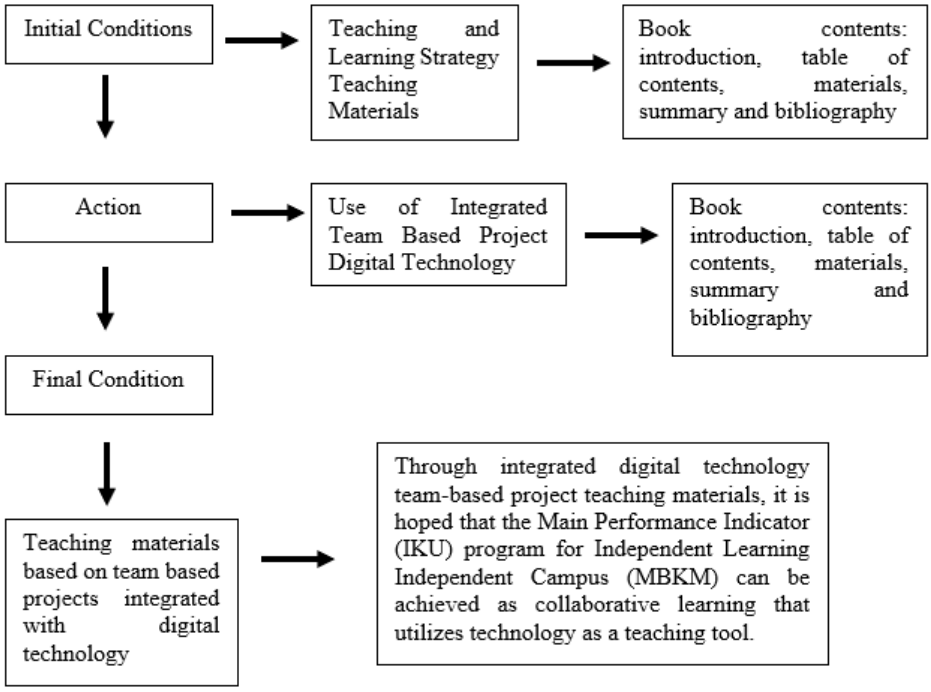


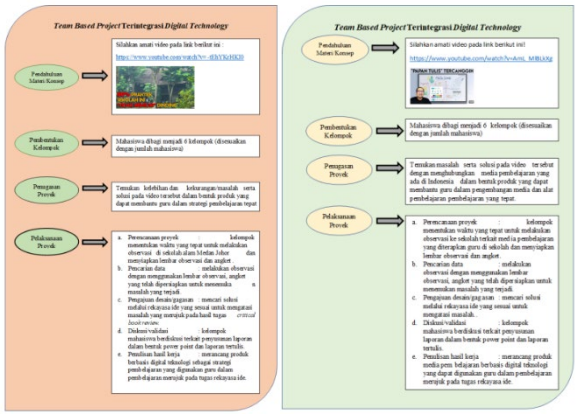
Fig. 2. Conceptual Frameworks

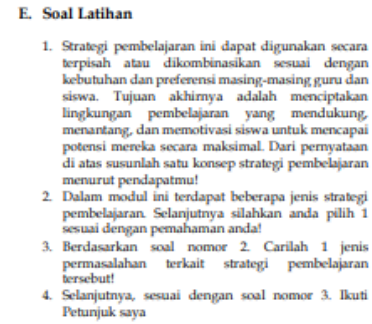
At the design stage, in addition to the initial design planning for the developed learning materials, the design of integrated digital team-based project-based teaching materials is carried out, namely including components contained in the teaching materials that involve team-based project stages and team-based project-based practice questions with the help of digital technology, designing a questionnaire on the feasibility of teaching materials to measure the validity of the product, designing a learning outcome test to measure the effectiveness of the developed product, and designing a questionnaire on the practicality of the product with aspects (ease of use, attractiveness of the presentation of the material, and the benefits of teaching materials in learning).

3.3 Development

At this point, the actions performed are developing teaching materials for the teaching and learning strategy course based on team-based projects integrated with digital technology. At this stage, an initial script is produced for the teaching material product as a product that is subject to validity data calculations. The following are the initial products produced in this study, as seen in Table 2:

Table 2. Prototype of Integrated Digital Technology Team Based Project Teaching Material Product

Early Prototype	Final Prototype
	
Initial product before the feasibility stage is carried out by material and construction experts	The final product has gone through the product feasibility/validity stages from material and construction experts.
The application of team-based projects in teaching materials is not in accordance with the material being discussed.	
	The application of team-based projects in teaching materials can be seen in several chapters of the material and has been integrated with digital technology.

The presentation of practice questions is not yet integrated into problem solving	 **E. Soal Latihan** 1. Strategi pembelajaran ini dapat digunakan secara terpisah atau dikombinasikan sesuai dengan kebutuhan dan preferensi masing-masing guru dan siswa. Tujuan akhirnya adalah menciptakan lingkungan pembelajaran yang mendukung, menantang, dan memotivasi siswa untuk mencapai potensi mereka secara maksimal. Dari pernyataan di atas susunlah satu konsep strategi pembelajaran menurut pendapatmu! 2. Dalam modul ini terdapat beberapa jenis strategi pembelajaran. Selanjutnya silahkan anda pilih 1 sesuai dengan pemahaman anda! 3. Berdasarkan soal nomor 2. Carilah 1 jenis permasalahan terkait strategi pembelajaran tersebut! 4. Selanjutnya, sesuai dengan soal nomor 3. Ikuti Petunjuk saya One of the practice questions in the teaching materials developed

Experts in various domains provide material validation data at this stage of development. Material specialists in the domains of technology and pedagogy assess products. Validators evaluate on the basis of relevant factors. Table 3 below displays the validation's findings.

:

Table 3. Validation Results of Integrated Digital Technology Team Based Project Teaching Materials (Initial Prototype)

Assessment Indicators	**Grade**
Suitability of material with graduate achievements and course learning outcomes	3,5
The discussion is in conformity with the team based project method, and is integrated with the use of technology	3
The level of difficulty of the material is in keeping with the traits of the pupils	3,7
The systematic writing of open material is clearr coherent, complete and easy to understand.	3,7
Average	**3,5**

It is evident from the data that the average validation calculation carried out on the initial prototype teaching material product is 3.5. This calculation can refer to the interval table for determining the level of validity of a teaching material product that the range of $3 \leq Va < 4$ can be said that the product is valid. The input and suggestions given by the validator are that the discussion of the material is not in accordance with the team-based project method, and is integrated with the use of technology, the cover/book cover is made more attractive, and the presentation of questions is adjusted to the team-based project method.

Referring to the average value generated on the initial prototype and the input and suggestions given by the validator, so that the product on the initial prototype was revised to obtain the level of material suitability with the team based project method, and to implement the use of technology in it. Furthermore, the following is the assessment of the validation of the final prototype product after the revision can be seen in the following table 4:

Table 4. Validation Results of Integrated Digital Technology Team Based Project Teaching Materials (Final Prototype)

Assessment Indicators	Grade
Suitability of material with graduate achievements and course learning outcomes	3,8
The discussion is in accordance with the team based project method, and is integrated with the use of technology	3,7
The level of difficulty of the material is in accordance with the characteristics of the students	3,9
The systematics of writing teaching materials are clear, coherent, complete and easy to understand.	3,8
Average	**3,8**

Table 4 illustrates that the average validation calculation carried out on the final prototype teaching material product is 3.8. This calculation can refer to the interval table for determining the level of validity of a teaching material product that the range of numbers $3 \leq Va < 4$ can be said that the product is valid. This calculation shows that this final prototype is a product that has been developed and can be used/implemented in class.

3.4 Implementation

3.4.1 Product Effectiveness

Pretest and posttest activities were used to analyze student learning outcome data in order to determine the efficacy of the team-based project learning technique in the teaching and learning strategy course. Five levels were used to classify the student learning outcomes: very low, low, medium, high, and very high. The learning objectives listed in table 5 below are as follows:

Table 5. Level of Student Learning Outcomes in the Teaching and Learning Strategies Course.

No	Interval	Level	Pretest	Posttest
1	50 - 60	Enough	120	50
2	61 – 80	High	100	20
3	81 – 100	Very high	30	180
Total			**250**	**250**

The following is a diagram depicting the scores based on the category level of the pretest and posttest results for the teaching and learning strategies course, as seen in Figure 3:

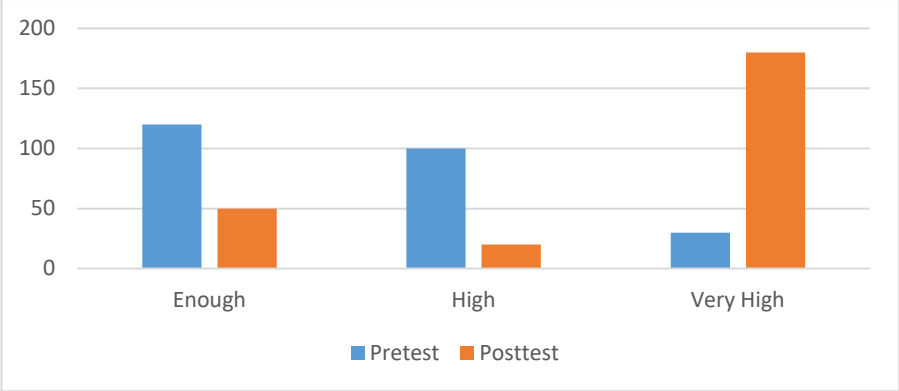


Fig. 3. Diagram of Category Levels of Pretest and Posttest Results for the Teaching and Learning Strategies Course

Using the technology-integrated team-based project method, the level of learning outcomes in the teaching and learning strategy course is determined. Next, the difference between the students' pretest and posttest results is calculated, either with a normalized N-Gain of 0.8 or with a high increase criterion of N-Gain = g> 0.7. Therefore, the teaching and learning strategy course's use of the technology-integrated team-based project learning technique has resulted in a high category rise in student learning outcomes.

In order to observe the integrated technology team-based project learning technique in the teaching and learning strategy course, data analysis was also done using descriptive analysis on the pretest and posttest learning results. According to the descriptive analysis's findings, students' average score in the teaching and learning strategy course was lower prior to treatment with the integrated technology team-based project method than it was following treatment.

It is known that the student learning outcomes before treatment with the technology-integrated team-based project method obtained a sufficient category of 120 people, a high category of 100 people, and a very high category of 30 people. The student learning outcomes after treatment with the technology-integrated team-based project method obtained a sufficient category of 50 people, a high category of 20 people, and a very high category of 180 people. This information can be used to descriptively analyze the category of student learning outcomes score in the teaching and learning strategy course.

The N-Gain score was used to calculate the increase in student learning outcomes following the pretest and posttest. The N-Gain score achieved > 0.3 or at least in the moderate range indicates if a learning approach is beneficial or ineffective. With a high category, the obtained Gain Score value was 0.8. Using the technology-integrated team-based project technique in the teaching and learning strategy course is beneficial, according to the N-Gain Score results.

3.4.2 Product Practicality

Verifying whether a thing is useful for learning is the aim of practicality. If a product satisfies the requirements for usability, presentation appeal, and educational material benefits, it can be used. Three professors completed the practicality questionnaire, which was collected

from pedagogical education lecturers. The data analysis findings, which were derived from the practicality calculation, are as follows:

Table 4. Recapitulation of the Practicality of Teaching Material Products for the Course on Integrated Digital Technology Team Based Project Teaching and Learning Strategies

R	Indikator									
	Ease of Use				The Attraction of the Presentation			Benefits of Teaching Materials		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	3	4	4	3	4	3	3	4	4	3
2	4	3	3	3	4	3	4	3	4	3
3	4	4	3	4	3	4	3	4	3	4
Total	11	11	10	10	11	10	10	11	11	10
Average Indicator	3,7	3,7	3,3	3,3	3,7	3,3	3,3	3,7	3,7	3,3
Average Aspect		3,5				3,4			3,6	
Average IP					**3,5**					

Considering the information in table 9 above, it can be seen that the average value for the ease of use aspect is 3.5, the average value for the attractiveness of the presentation aspect is 3.4, the average value for the principle of the benefits of teaching materials is 3.6. The average score for the integrated digital technology team-based project teaching and learning strategy course is 3.5, which is based on the average score for every component of the practicality assessment of the instructional material product. The level of practicality of the teaching materials for the integrated digital technology team-based project teaching and learning strategy course is in the high category, as can be seen from the average value obtained overall, which is referred to the criteria for determining the level of practicality that have been determined.

3.4.3 Evaluation

At this stage, there is a process of reflection and revision in perfecting the product produced so that it is suitable for use during the lecture process in Elementary School Teacher Education.

4 Conclusion

The application of collaborative learning and student participation through the use of project activities as the foundation of learning activities necessary to conduct exploration, analysis, synthesis, drawing conclusions, problem-solving, and the production of innovative products as a manifestation of the outcomes of team-based project activities conducted with digital technology is known as the implementation of integrated team-based projects. With learning achievement indicators outlined in the Semester Learning Plan and a description of Graduate Learning Achievements and Course Learning Achievements, this activity is conducted in the Elementary School Teacher Education Study Program at the Faculty of Education.

Analysis, Design, Development, Implementation, and Evaluation (ADDIE) research is the main focus of the research process. Five steps are used in the research of the ADDIE method

development procedure: (1) analysis; (2) design; (3) development; (4) implementation; and (5) assessment.

This study sought to determine the viability, efficacy, and usefulness of instructional materials created for the teaching and learning strategy course at State University of Medan's Elementary School Teacher Education using the team-based project method. It is anticipated that professors at the State University of Medan will be able to use digital technologies to develop team-based learning initiatives.

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