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Development of P3D Learning Strategy Using Google Sites to Support 21st-Century Skills

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ABSTRACT

This research aims to create a product (a P3D learning strategy using google sites to support 21st-century skills). This research employed Hannafin and Peck's Research and Development (R & D) method. A needs assessment (need assessment), product design (product design), product development, and implementation comprise the research design (development and implementation). Teacher and student interview sheets, media, material expert validation questionnaire sheets, and teacher and student answer sheets are among the instruments employed. Techniques for gathering data include interviews and questionnaires. Data analysis for interviews was accomplished by data reduction, data presentation, and conclusion drawing, whereas data analysis for questionnaires was accomplished through quantitative and qualitative methods. The study's population consisted of senior high school science-majored students in Lebak Regency, with a sample size of 30 from SMAN 1 Bojongmanik and 30 from SMAN 3 Cibeber. The product feasibility test, conducted by two media experts and two material experts, revealed that this product was feasible with an average value of 77%.

Pengembangan Strategi Pembelajaran P3D Menggunakan Google Sites untuk Mendukung Keterampilan Abad 21

ABSTRAK: Tujuan Penelitian ini untuk menghasilkan produk (strategi pembelajaran P3D menggunakan google sites untuk menunjang keterampilan abad 21). Metode penelitian menggunakan Research-Development (R & D) dengan desain penelitian yang dikembangkan oleh Hannafin and Peck. Desain penelitian terdiri dari penilaian kebutuhan (need assessment), desain produk (product design), pengembangan dan implementasi produk (development and implementation). Instrumen yang digunakan antara lain lembar wawancara guru dan siswa, lembar angket validasi ahli media dan materi, lembar respon guru dan siswa. Teknik pengumpulan data menggunakan wawancara dan angket. Analisis data untuk wawancara dilakukan dengan cara mereduksi data, penyajian data dan penarikan kesimpulan sedangkan analisis data pada angket dengan cara kuantitatif dan kualitatif. Populasi penelitian merupakan siswa dan siswi SMA MIPA di Kabupaten Lebak dengan sampel berjumlah 30 orang dari SMAN 1 Bojongmanik dan 30 orang dari SMAN 3 Cibeber. Hasil uji kelayakan produk oleh dua ahli media dan dua ahli materi menunjukan bahwa produk ini layak untuk digunakan dengan nilai rerata sebesar 77%.

Qiswatun Mukhoyyaroh[1*], Jajang Miharja[2], Beti Baldah[3], Anisyah Yuniarti[4]

INTRODUCTION

COVID-19 has influenced many disciplines, including education (Syah, 2020);(Ichsan et al., 2020);(Wulandari & Nofina, 2022).. Due to COVID-19, around 45 million Indonesian students are absent from school (Azzahra, 2020). The face-to-face learning process in class has now changed and substituted online (Fitriani et al., 2020);(Verawardina et al., 2020);(Bujuri & Baiti, 2019);(Riski, 2021). This circumstance has an impact on the quality of learning. Online learning encounters a variety of challenges, including IT restrictions (Putria et al., 2020);(Refendi et al., 2020), facilities and infrastructure, access, and resistance to technological changes (Safford et al., 2016);(Rasheed et al., 2020);(Muslihudin et al., 2018). Restrictions were also discovered in schools with full ICT-related resources and infrastructure. The interviews with teachers at school reveal that teachers struggle with supervising students and establishing online learning procedures to provide directed and regulated learning. According to Lowrey et al., (2019), teachers struggle with online learning planning, such as determining online learning stages, learning methodologies, and learning techniques. Furthermore, the teacher stated that online learning decreases student involvement in speaking or collaboration during online learning because there is no place for discussion between students and teachers and among students. According to Chang & Fang (2020), the obstacles teachers confront in online learning include online discussion, online communication, and feedback. This issue demonstrates that two 21st-century skills, namely teamwork and communication skills, were not adequately realized during online learning during the COVID-19 period. With these challenges and problems, an online learning design that meets the requirements of controlled and directed learning while supporting 21st-century abilities is required.

The P3D learning strategy using Google Sites includes problem-solving, practical presentation, and decision-making. This learning strategy attempts to teach students to explain the outcomes of making decisions (solutions) to existing problems using a variety of scientific approaches. The Google sites include interactive P3D learning strategy steps, allowing teachers and students to conduct online learning in a directed and controlled manner via the sites. Google sites have various features like Docs, Sheets, Forms, calendars, quizzes, etc. These features can be combined and shared as needed (Waluyo & Siregar, 2022);(Zen, 2018);(Webb & Jose, 2019);(Waluyo, 2021). This feature allows students to collaborate with anyone, anywhere. This research represents a significant educational advancement because it delivers learning strategies packed into websites (Google Sites). Furthermore, the P3D learning strategy fosters 21st-century skills (communication and collaboration). Yuniarti (2018) found that the DP4 learning strategy (demonstration, practical work-discussion, presentation-discussion, practical work-discussion, and presentation-discussion) can increase students' conceptual mastery and numeric literacy.

The research on developing a P3D learning strategy using Google sites to support 21st-century abilities is predicted to be able to answer online learning obstacles, fulfill controlled and directed learning stages, and support 21st-century skills.

Based on this context, the study's objectives are: (1) Create a P3D learning strategy for 21st-century skills using Google Sites, and (2) Explain the feasibility of P3D learning strategies for 21st-century skills using Google Sites. The importance of this research is to (1) obtain products as an alternative option for teachers in implementing directed and controlled online learning and (2) P3D learning

Qiswatun Mukhoyyaroh[1*], Jajang Miharja[2], Beti Baldah[3], Anisyah Yuniarti[4]

strategy using Google sites that develop not only collaboration and communication skills (21st-century skills) but also ICT literacy.

METHOD

The Research and Development (R & D) method was employed in this study, along with a research design constructed by Hannafin and Peck. The research design is divided into various stages: needs assessment, product design, product development, and implementation Pangestu (2021). This research approach was chosen because it allows for evaluation and revision at each level. It seeks to obtain a high-quality product that is also functional. Figure 1 depicts the research plan.

This study was carried out at SMAN 1 Bojongmanik, located at Jalan Raya Bojongmanik-Cilayang km 2 Bojongmanik District, Lebak Regency, Banten Province. The second research site is SMAN 3 Cibeber, located at Jalan Raya Pasir Kuray Km. 15 Tegallumbu Wanasari Village, Cibeber District, Lebak Regency, Banten Province. The science-majored students from senior high schools in Lebak Regency, Banten Province, made up the study population. The research samples were 30 tenth-grade science students of class X MIPA 3 from SMA Negeri 1 Bojong Manik and 30 from SMA Negeri 3 Cibeber.
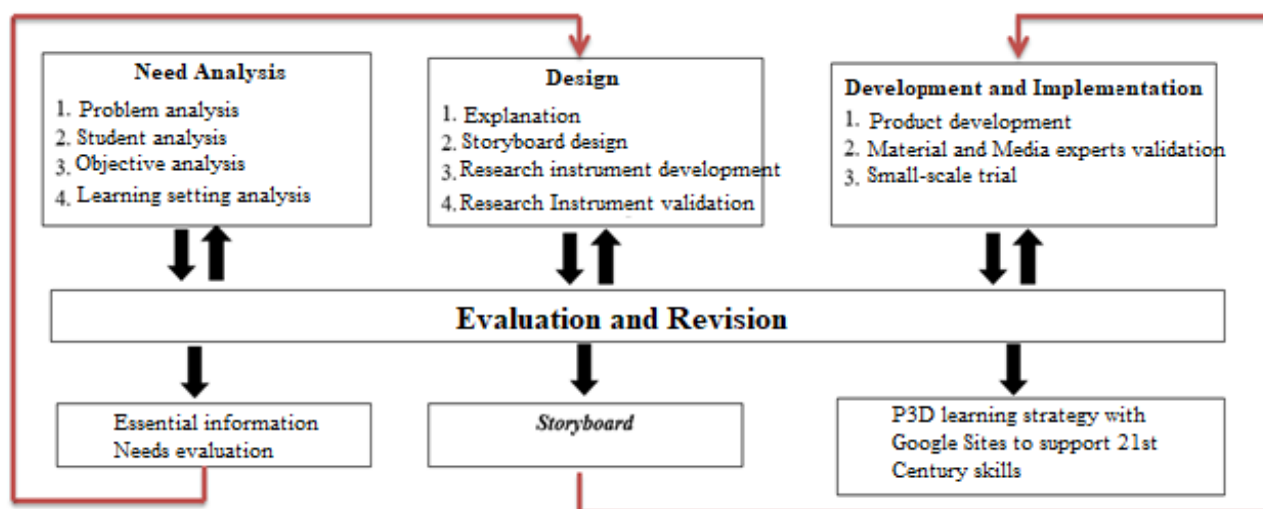

Figure 1. Research Design

The employed research instruments are as follows:

1. Interview Sheets for Teachers and Students

An interview sheet is a tool for gathering information regarding biology classes' teaching and learning processes. On this instrument, data was collected utilizing planned interview procedures. The interview technique was used both directly (researchers meeting the informants directly) and indirectly (researchers meeting the informants indirectly via Google Forms).

The interviews were done during the needs analysis and product implementation stages. Interviews during needs analysis seek to identify problems and generate suitable solutions, whereas interviews during product implementation seek to gather user information about product implementation. One biology teacher from SMA Negeri 1 Bojongmanik and one from SMA Negeri 3 Cibeber were interviewed, while two students from SMA Negeri 1 Bojongmanik and SMA Negeri 3 Cibeber were also interviewed.

2. Material Expert Validation Questionnaire

The validation questionnaire sheet is an instrument that comprises several questions to gather material experts' opinions on the feasibility of a P3D learning strategy using Google sites to promote 21st-century abilities (Murdana, 2022). Two Biology Education lecturers served as the material experts. A close-ended questionnaire was used in this research. The questionnaire was employed to gather data on the instrument. The data was analyzed quantitatively (by determining the average score) and then qualitatively (quantitative scores were interpreted into quantitative categories). The following are the steps of data analysis based on the material expert validation questionnaire responses:

1) Each statement in the questionnaire is accompanied by an answer using a 5 Likert scale. The following is the Likert scale used in this study:

Table 1. Likert Scale

Likert Scale	Description
5	Strongly agree
4	Agree
3	Moderately agree
2	Disagree
1	Strongly disagree

2) Calculate the average score of each aspect disclosed in the questionnaire. The average formula is as follows:

$$NP = \frac{R}{SM} \, x \, 100\%$$

Description:
NP = Percentage score
R = Obtained score
SM = Maximum score

3) The results of the percentage score calculation for each aspect are then interpreted or described into categories to determine the feasibility value of the resulting product, as shown in Table 2 below:

Table 2. Feasibility Category

Achievement Level (%)	Qualitative Category
81% - 100%	Highly feasible
61% - 80%	Feasible
41 % - 60%	Less feasible
0% - 40%	Not feasible

(Source: Salsabila & Aslam, 2022)

The material expert validation questionnaire revealed aspects such as the competencies to be attained, P3D learning strategy, environmental change materials, and 21st-century skills. A matrix of material expert validation questionnaire sheets is provided below.

Table 3. The Matrix of Material Expert Validation

No	Aspects	Indicators
1.	Attained competencies	• Material conformity with competency. • Competency-based learning indicators. • Learning objectives are established based on competency.
2.	P3D Learning strategy	The presence of a P3D learning strategy on Google Sites on the material and lesson plans.
3.	Material	• Current content (current) • Citations used. • The accuracy of the material's content. • Material coverage. • Adequate material.
4.	21st Century skills	Content materials promote 21st Century skills.

Qiswatun Mukhoyyaroh[1*], Jajang Miharja[2], Beti Baldah[3], Anisyah Yuniarti[4]

3. Media Expert Validation Sheet

The media expert validation questionnaire is an instrument that contains a series of questions designed to elicit learning media experts' opinions on the feasibility of P3D learning strategies using Google sites to enhance 21st-century skills. Two Biology Education lecturers served as media experts in this study. The type of questionnaire employed is a close-ended questionnaire, in which the researcher prepares the questions, and the respondent simply selects the available answers. The media expert validation questionnaire showed usability, functionality, visual communication, website design, P3D learning strategies, and 21st-century skills. The data analysis stages are the same as the data analysis for the material expert validation questionnaire. Table 4 depicts the media expert validation questionnaire matrix.

Table 4. The Matrix of Media Expert Validation

No.	Aspects	Measured Indicators
1.	*Usability*	• Easy to learn • Efficient • Easy to remember
2.	*Functionality*	• Accuracy • Compatibility
3.	*Visual communication*	• Communication
4.	*Website design*	• Layout • Visual quality
5.	P3D learning strategy	• Use of motion media (animation and video) • P3D learning strategy • Problems • Practical • Presentation • Decision making
6.	21st Century skills	• Communication, Collaboration

RESULTS AND DISCUSSION

According to the findings of interviews with several teachers, the online learning process encountered various obstacles or issues, such as difficulty in identifying regulated and guided learning processes. This assertion is corroborated by research conducted by Bahasoan et al., (2020), which found that teachers struggle with online learning planning, such as determining online learning phases, learning approaches, and learning methodologies. Discussion and collaboration are not possible in this study. This study represents a new educational breakthrough in which P3D learning strategies employing Google sites enable directed and controlled learning while supporting 21st-century skills.

1. Development of P3D Learning Strategy Using Google Sites to Support 21st-Century Skill

The researchers employed Research-Development (R & D) with a design introduced by Hannafin and Peck. The research design comprises need assessment, product design, and development and implementation (Pangestu, 2021);(Puspitasari & Purbosari, 2021).

a. Need Analysis

A needs assessment is the first step in this research. Exploration of potential problems that are the topic of study is known as needs assessment (Hanafi,

2017). The goal is to determine the school learning state and the components required in the product development process. Furthermore, the initial research information collection for the product is carried out at this time (Silalahi & Malau, 2020). This needs assessment is divided into various stages: problem analysis, student analysis, learning objectives analysis, setting analysis, evaluation, and modification (Pratomo, 2007). This needs assessment information is subsequently summarized as vital product information. An interview technique was employed to obtain data for the needs assessment with three Biology teachers and three eleventh-grade high school students.

b. Product Design

This stage entails translating the essential product information (the needs assessment results) into storyboard form. By changing the relevant information from the needs assessment, the storyboard follows the sequence of P3D learning approach activities using Google sites. The design stage is divided into numerous sections. First, some context. Theoretical studies and research findings explain the outcomes of the essential information analysis from the needs assessment. Second, create the design (storyboard), build the instrument, and test it. Third, there is evaluation and correction.

c. Development and Implementation

This stage's goal is to create a product. The first stage is product development. The storyboard is then utilized as the foundation for product development. Second, perform a product validation test. Material and media experts evaluate the feasibility of the produced product. Finally, limited testing. Product testing activities for a small number of research subjects. During this experiment, information on product criticism and ideas was gathered. Fourth, there is evaluation and correction.

2. The Feasibility of P3D Learning Strategy Using Google Sites to Support 21st-Century Skills

The media and material experts use a questionnaire to assess the practicality of the product created. The data analysis on the material and media expert validation questionnaire instrument reveals that the product is feasible, with an average of 77% in the feasible category. This result suggests that the P3D learning technique based on Google sites for 21st-century skills is a feasible alternative. Yuniarti (2018) supported this finding. The findings of this study suggest that the DP4 learning technique (demonstration, practical work - discussion, presentation - discussion, practical work - discussion, and presentation - discussion) can help students enhance their conceptual knowledge and mathematical literacy. Yoriska (2021) studied the development of learning media utilizing Google sites, with the findings indicating that the generated research product in the form of biology learning media regarding blood circulation was feasible to use in the learning process. Figure 2 depicts the value of each material and media expert.
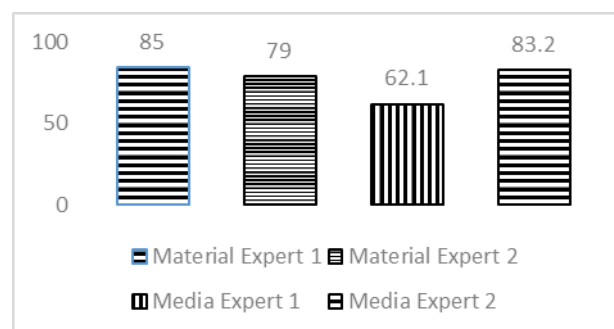

Figure 2. Recapitulation of Product Feasibility Values from Media and Material Experts

According to Figure 2, the product feasibility test conducted by media experts yields an average of 62.1% in the feasible group and 83.2% in the highest feasible category (Table 2). Usability, functionality, visual communication, website design, P3D learning strategies, and 21st-century skills were disclosed in the media expert validation questionnaire (Table 4). Figure 3

Qiswatun Mukhoyyaroh[1*], Jajang Miharja[2], Beti Baldah[3], Anisyah Yuniarti[4]

depicts the results of the evaluation of each aspect of media expert validation. According to Figure 3, the average percentage value of each element in the material expert validation test is between 61% and 80% in the feasible category (Table 2).
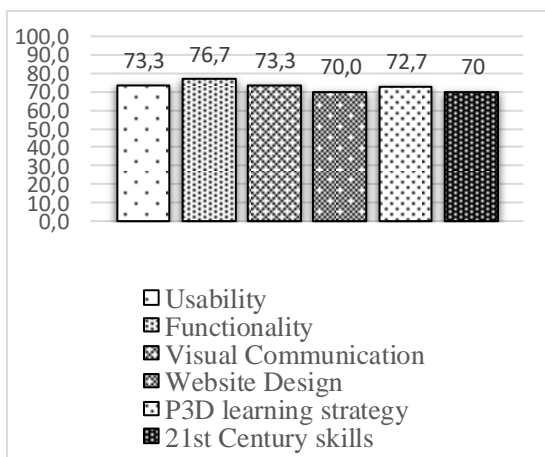

Figure 3. The Average Percentage of Each Aspect of the Product Validation by Media Experts

According to Figure 3, the feature of functionality has the highest average percentage compared to other aspects, with 76.7% in the appropriate category. Media experts said the navigation menu on the constructed Google Sites website was operational. Aspects of website design (website layout) and 21st-century skills have the lowest average percentage value, namely 70% in the feasible category.

Media experts offered criticism and suggestions for the product. Media experts expressed criticism on the factors of usability indicators of memorability (easy to remember) in the form of designating excessively long website addersses, making it difficult for students.

The Google site's link was https://sites.google.com/view/pencemaranlingkungan-stkipltm/home. Then, media experts recommend modifying the website address, shortening the link, and using fascinating terms to make it easier for students to remember. The link has been revised and modified to https://bit.ly/Perubahan lingkungan.
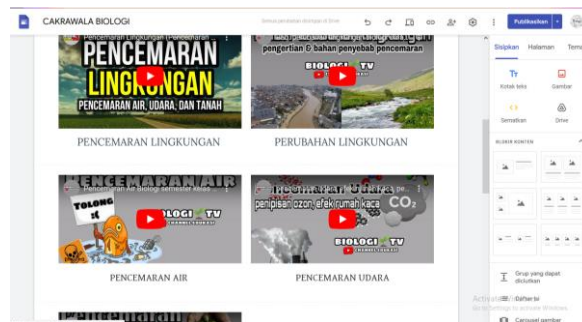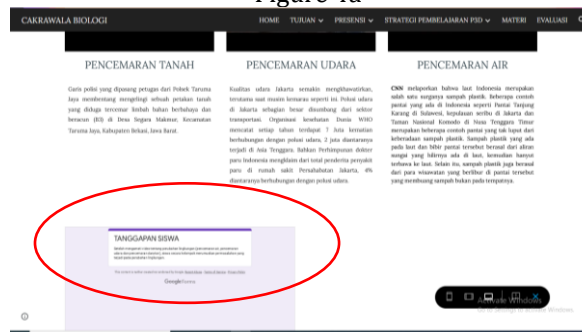

Figure 4a

Figure 4b

Figure 4. Video Display on "Problem" Menu (a) The Video Display before Revision; (b) The Video Display after Revision

Media experts critique visual communication components such as information and communication presentation. According to media experts, the website material is adequate for displaying information to visitors; only communicative content, such as adding comments to videos, is required. Figure 4a depicts a portion of the "Problem" navigation menu, which includes many videos depicting environmental contamination cases. These videos act as a stimulant medium for students to solve challenges and find solutions. A Google Form section was added to the video menu to improve it (figure 4b). The Google Form section allows students to submit their responses to environmental contamination issues. The Google Form will capture student replies. According to Surjono, (2017), the creation of learning multimedia focuses on the principles of animation or video and temporal continuity, which are given alongside narration. The feedback principle must govern interactive

multimedia development (Chen et al., 2020).

Media experts praise website design. According to media experts, website menus and submenus design are consistent, and the layout is fairly nice. According to Nemkova et al., (2019), interactive media development must pay attention to these media components, such as creating website menus. On the other side, media experts criticize the website's appearance, which is still extremely simple and needs to be enhanced with color variants and icons on the navigation menu to look more appealing.

Figure 5 depicts the "Menu" navigation of the website with a simple design (before revision), and Figure 5b depicts the video on the "Home" page (before revision). The website design should be updated by adding appealing colors and icons to the navigation menus. According to Tengku Wook et al., (2020), the website's navigation menu can be understood as a guide for the visitor when exploring the content of a website page. The navigation menu is an important feature for website pages in attracting users' interest in reading the content. Tengku also stated that two factors must be considered when developing a navigation menu.

First and foremost, the navigation menu must be simple to use and remember. Second, the navigation on the same site must be consistent from one page to the next. Users will be confused if there is inconsistency. Third, the symbol on the navigation menu should reflect what information is hidden below the menu. The colors used on the Google Sites website indicate the identity you wish to convey to users. Color gives the website a distinct personality. As a result, web designers must be able to develop appealing color combinations on website pages that entice people to read and comprehend the information on the website (Raymaker et al., 2019).

Figure 5a

Figure 5b

Figure 5. Website Display of (a) the "Home" Navigation Menu with a Simple Design (before Revision); (b) the "Home" Navigation Menu with a Colorful Title Template Design (after Revision)

Product feasibility is determined not only by the media but also by the material. Material experts evaluate the feasibility of products based on features of competence to be attained, P3D learning methodologies, and 21st-century materials and skills (Table 3). The analysis of the media expert validation questionnaire revealed that the competency aspect to be achieved had the highest average percentage score among other aspects, namely 90% in the very feasible category. In contrast, the P3D learning strategy aspect had the lowest average percentage score among other aspects, namely 70% in the very feasible category. Figure 6 depicts the average percentage value of each aspect in the product validation test conducted by media experts.

Material experts, in addition to media experts, offer criticism and suggestions about the product. One of the concerns raised by material experts is that the competencies to be attained in learning indicators in lesson plans are not following basic competencies (KD). However, practicum objectives in Google Sites are aligned with core and basic competencies.

Qiswatun Mukhoyyaroh[1*], Jajang Miharja[2], Beti Baldah[3], Anisyah Yuniarti[4]

According to Liao et al., (2021), the material offered in interactive learning must adhere to instructional or pedagogical criteria to be easily understood. The material's content must agree with the learning objectives and the depth and breadth of the user's educational level. The content of interactive learning materials refers to National Education Standards Agency (BSNP) standards such as content standards.
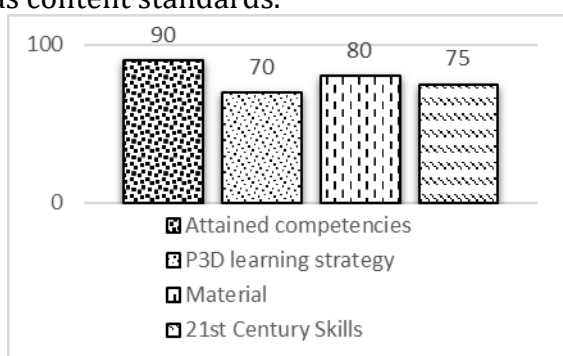

Figure 6. The Average Percentage of Each Aspect of the Product Validation by Material Experts
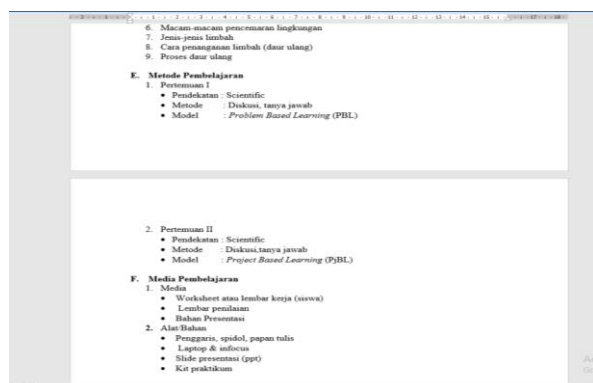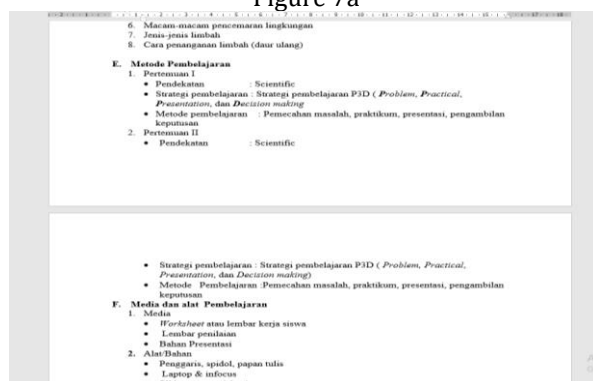

Figure 7a

Figure 7b

Figure 7. Lesson Plans; (a) The Learning Approach and Learning Methods in the Lesson Plans are not in line with the Developed Product (before Revision); b. Approaches, Learning Strategies, and Learning Methods are in Line with the Developed Product (after Revision)

Material experts also make recommendations for the affirmation of the lesson plan regarding the learning strategies and methods employed in the lesson plans. According to Figure 7a, the lesson plan's learning approach and learning methods are not in accordance with the product being developed. As a result, there are changes in Figure 7b relating to the approaches, strategies, and learning methods used in the P3D learning strategy. This is in line with (Cisca et al., 2021) that lesson plan needs to be strategic, yet simple and accessible when preparing for learners' needs, curriculum development and lesson planning helped indentify desired outcomes, determine acceptable learning experiences in the classroom setting (Pratama et al., 2020). Creating and addressing learning targets prior to start of instruction enable stucents to actively participate during the learning process(Cuñado & Abocejo, 2018):(Handoko et al., 2021).

CONCLUSIONS AND SUGGESTIONS

Data analysis on the validation questionnaire for material and media experts shows that the product is feasible, with an average of 77%. It means that the P3D learning strategy based on Google Sites to enhance 21st-century skills is feasible after considering various ideas and criticisms from media and material experts. According to the findings of this study, the product generated in the form of Google Sites learning media for 21st-century skills on the concept of protists was feasible to be used and received positive feedback from students.

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