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The Development Of React Strategy-Oriented Learning Media on Specialization Mathematics For 12th-Grade SMAN 1 Kembangbahu

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Abstract: The occurring digitalization of education due to the Covid-19 pandemic is an unavoidable situation. The aims this study was to develop REACT strategy-oriented learning media on specialization mathematics for 12th-grade. This study used the 4D development model (Define, Design, Develop, Disseminate). The data collection instrument is a questionnaire form that was distributed to material experts, learning design experts, media experts, and respondents. Respondents for individual, small group, and field trials were 12th-grade students of SMAN 1 Kembangbahu. The results of the feasibility test of learning media got percentages of 83%, 89%, and 93% from material experts, learning design experts, and media experts. The results from individual trials are 91%, from small group trials 88%, and from field trials are 90%. Based on the results of the validation, the interactive REACT-oriented Google Sites learning media on Specialization Mathematics for 12th-grade students of SMAN 1 Kembangbahu concluded as feasible for use as specialization mathematics learning media with an average percentage of 90%.

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Introduction

The use of digital educational media during the Covid-19 pandemic has increased because learning is mostly carried out online. This increase is marked by an in-crease in internet use by 40% since the implementation of online learning (Setiawan, 2020). Learning during the Covid-19 pandemic resulted in extraordinary changes, all levels of education were transformed to adapt suddenly to do learning from home through online me-dia. Each level of education is required to be able to adapt briefly so that learning continues to run effectively during the Covid-19 period.

The 2018 test results showed a score of 379 while in 2015 the score of PISA was 389. PISA stated that 76% of the Indonesian students' numeration skills did not reach level 2, which is the lowest score level (OECD, 2019). The needed innovation for the learning process is teaching by delivering those skills using learning facilities such as using learning technology which aims to increase students' learning motivation and learning effectiveness so that the students are expected to understand the provided mate-rials.

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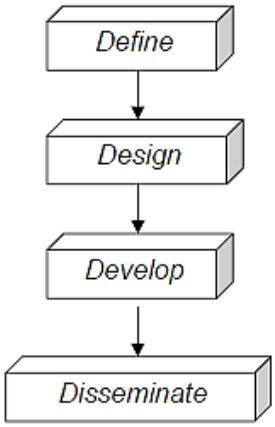
The PISA mathematical process consists of being able to formulate problems mathematically, being able to use concepts, facts, procedures and reasoning in mathematics, being able to interpret, apply and evaluate the results of a mathematical process. This process is in accordance with the concept of the REACT strategy, because the use of the REACT strategy in learning mathematics can im-prove students' habits in analyzing real-life phenomena and leave long-term memories in students after learning (Musyadad & Avip, 2020).

The transition from pandemic to endemic Covid-19, the government allowed the implementation of limited face-to-face learning through the Circular Letter of the Minister of Education, Culture, Re-search, and Technology (Mendikbudristek) Number 3 of 2022. This limited face-to-face implementation resulted in teachers having to prepare effective and efficient learning media for hybrid learn-ing. Mathematics learning activities using the website can shorten the learning time or be more practical and make the cost of lessons more economical (Andry & Stefanus, 2020). Website-based collaborative learning can develop students' problem-solving skills (Lin et al., 2020). The website can also facilitate the inter-action of students with the materials that have been provided and can access learning materials at any time to repeatedly, and the website is a knowledge development process that does not only occur in the classroom, but outside the classroom. SMAN 1 Kembangbahu does have a school website, but it only contains school information and operational access to the website is very limited, not all teachers can fill out pages on the web-site. Therefore we need a website that can be easily accessed and developed by teachers and students. Google Sites is a media website that is easy and cheap to access. In addition, students at SMAN 1 Kembangbahu are allowed to use smartphones and laptops so that they support this learning media. The purpose of developing this product is to produce REACT Strategy-oriented learning media in mathematics subjects that are valid.

Research Method

This research is development re-search, which in this study researchers used a 4D development model by Thiagarajan (1974). The 4D model developed by Thiagarajan has four main stages, namely define, design, develop, and disseminate.



Figur 1. The 4D Model

In the define stage, the researcher performs front-end analysis, learner analysis, task analysis, concept analysis, and specifying instructional objectives. At the design stage, the researcher conducted criterion test construction, media selection, format selection, and initial

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design. At the develop stage, the researcher conducts expert appraisal and development testing. In the last stage, namely the disseminate stage, the researcher carried out validation testing, packaging, diffusion, and adoption.

The data collection instrument used in this research is a questionnaire form which was distributed to the validators and respondents. The validators consist of material experts, learning de-sign experts, and media experts. The respondents were 1 teacher and 46 students of SMAN 1 Kembangbahu.

Development research of learning media in Specialization Mathematics subject used a questionnaire instrument that was given during expert validation tests and development trials. Questionnaire answers are arranged based on a Likert scale. The Likert scale consists of five rating scale categories which can be seen in the table below.

Tabel 1 Rating Scale Criteria

Score	Category
5	Very good
4	Good
3	Adequate
2	Inadequate

Result and Discussion

The research step for developing interactive learning media is through several stages that have been adapted from the 4D development model. The first one is the define stage to determine and define the learning conditions. This stage ex-plains that the website-based learning media for Specialization Mathematics subjects for 12th-grade is still not a common learning media at SMAN 1 Kembangbahu. It is known that the teachers still often use conventional media such as printed modules and presentations with PowerPoint.

The pandemic period requires teachers to use various digital-based media to deliver the learning material. This is also related to the readiness of the teachers to help the students to converge in the era of civil society 5.0. This is in accordance with the opinion of Alimuddin, Director of HAFECS (Highly Functioning Education Consulting Services) that in the era of civil society 5.0, teachers are required to be more innovative and dynamic in teaching in the classroom (Faulinda & Ni'mal, 2020). Learning mathematics in the 21st century, learning in the classroom undergoes a transformation of learning through the internet (Engelbrecht et al., 2020).

The students of 12th-grade as the research subject are at the stage of for-mal operational development, so they can operate the media well. At the stage of formal operational development, students can think abstractly and logically, can self-reflect, imagine the roles of adults, and can pay attention to the interests of society.

Therefore, REACT Strategy -oriented learning is needed to guide the students to relate the material to the real world, learn in an exploratory con-text, apply the knowledge that has been obtained, work together, and transfer the knowledge they have to solve the problems they face.

The purpose of the design stage is to construct the learning media that will be developed. At this stage, the design of learning media in the form of REACT Strategy-oriented Google Sites was carried out. Researchers designed Google Sites based on

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curriculum analysis and material analysis, which the Google Sites will be made to adapt to the chosen learning strategy's syntax, namely the REACT strategy.

The preparation of the test is based on the learning objectives that have been formulated. The questions used in this interactive learning media are multiple-choice questions to encourage students to apply the new material they have obtained. This multiple-choice question will be placed on the MATH-APPLY page, because it matches the syntax of the third REACT strategy, which is applying. At the applying state, the teacher can provide exercises that are realistic, relevant, and show benefits in an area of life (Harmin et al., 2020).

Furthermore, the questions used are essay questions that contain the application of material to essay questions that guide students to work together in applying the material. This question is done in groups and placed on the MATH-COOPERATE menu. This is because at the cooperating stage, students discuss the knowledge that has been found and communicate with each other the ideas and ideas of students regarding ongoing learning (Arisa & Yarman, 2021). This es-say question is displayed using Google Docs.

In addition to the MATH-COOPERATE menu, essay questions are also placed on the MATH-TRANSFER menu, but with different content. At the transferring stage, the questions used are essay questions that contain the ap-plication of material to problem solving that leads students to transfer their knowledge and skills in problem solving with new situations (Utami et al., 2016).

The initial design for developing REACT strategy-oriented learning media is in the form of draft I to be continued at the develop stage. At this stage, validity testing and development trials will be carried out. The validity test was carried out by three experts, namely material experts, learning design experts, and learning media experts. Development trials were carried out with one col-league, three students in individual trials, six students in small group trials, and 35 students in field trials.

Expert validation will assess the feasibility of the developed product de-sign by providing an assessment in terms of language, design, content/depth of material, technology, media and so on. Based on the assessment of these experts, the first draft will be revised to produce a good, effective, and useful product.

The development trial activity was carried out to obtain reactions, comments and responses from users of the developed interactive module. So that the results of the development trials will be used as input in the improvement of the interactive module. These trials and revisions are carried out continuously with the aim of producing better and more effective products.

Thiagarajan (1974) divided the disseminate stage into three activities, namely validation testing, packaging, diffusion, and adoption. Where this stage is carried out to spread the product developed so that it can be used by many users, especially class XII SMA. Products developed and distributed can be absorbed, used and adapted to classes or schools in a wider scope. However, in this development research, it was only disseminated on a limited basis, namely to practitioner schools at SMAN 1 Kembangbahu.

The validity of the REACT strategy-oriented learning media on specialization mathematics at SMAN 1 Kembangbahu which was developed is deter-mined from the percentage score obtained from filling out a questionnaire with a Likert scale. Based on the results of the material expert validation, the percentage of the material expert validation results was 83%, the learning design expert validation results were 89%, and the learning media expert validation results were 93%. The average validation result obtained is 88%.

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After being con-verted to the level of validity, the RE-ACT-oriented interactive learning media Google Sites is included in the eligible qualifications.

Based on the comments and suggestions of material experts, learning designs, and learning media, revisions were made. The revision was carried out by providing activities to determine the initial abilities of students. It is important for a teacher to know the initial ability of students to be able to plan effective learning. This is according to Thiagarajan (Yunika et al., 2020) which states that at the learner analysis stage it is necessary to learn about the characteristics of students, such as abilities, learning motivation, background experience, and so on. The prerequisite abilities needed by students also need to be informed so that students can adjust and prepare themselves.

In addition, revisions are made to the background affecting the comfort of students in using the media, for that it is necessary to choose one that is comfortable to see and does not disturb students. As stated by the Education Association (Yamin & Karmila, 2020), media is an object that can be manipulated, seen, heard, read, and discussed along with the instruments used both in teaching and learning activities that can affect the effectiveness of learning programs.

After revision, draft II was prepared for peer trials and development trials. The results of the peer test, the percent-age is 92%, the qualifications are very feasible. After that, an individual trial was conducted on 3 students and the percentage of 91% of the qualifications was very feasible. Small group trials of 6 students obtained a percentage of 88% eligible qualifications. Field trials on 35 students obtained a percentage of 90% very eligible qualifications. The average test results obtained per-percentage of 90%, if converted to the level of validation then included in the qualification is very feasible.

Based on development trials, respondents said that the content of the material was interesting and made it easier for them to understand the material because it was associated with examples in everyday life. According to the statement Widada et al. (2020) that in learning students see and pay attention to environmental conditions and events in everyday life, then they are linked in new information or problems to be solved. Respondents also said that the media was interesting because it was equipped with various pictures, videos, and questions. This is in accordance with the opinion of Rachmavita (2020) that we need interesting learning media in mathematics, especially if it is made with interactive media in the form of videos that combine images, animation, music, and sound.

After going through revision II, a development product that is worthy of being disseminated is formed. The deployment process is the final stage of development. At this stage, the use of Google Sites interactive learning media that has been developed is disseminated on a wider scale.

Dissemination and application of this learning media by providing links to REACT strategy-oriented learning media to mathematics teachers in schools as practitioners. Further dissemination was carried out by distributing the Google Sites learning media link to the MGMPS Mathematics WhatsApp group at SMAN 1 Kembangbahu. This media is limited to SMAN 1 Kembangbahu and contains Normal Distribution material for the XII class specialization mathematics subject.

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Conclusion

Based on the results of the study, it can be concluded that the REACT strategy-oriented learning media developed using the 4D development model is suitable for use in learning mathematics with specialization in 12-th grade with a feasibility percentage of 90%.

Recommendation

The development of REACT strategy-oriented learning media on specialization mathematics at SMAN 1 Kembangbahu focusing on normal distribution material, for further development it can be done by adding binomial distribution material. In addition to adding material related to statistics, it is necessary to add other material to the mathematics subject of specialization in class XII so that the complete learning media covers all the material in one academic year.

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