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Learning Media Development using Transformative Learning Strategy Android Application as a Distance Learning Support on Static Fluid

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Abstract

This research aims to develop and produce an Android application using a Transformative Learning Strategy as a Distance Learning on static fluid material. The research used Research and Development (R&D) method, which refers to the Dick and Carey model. The instrument was a questionnaire using a Likert scale and analyzed with a continuous line. According to media experts, this Android application had a validation test phase with a successful percentage of 96% according to matter experts and 80%. According to learners, this application trial was conducted to 30 students of class XI MIPA and physics educators/teachers at SMA Negeri 109 Jakarta with a percentage achievement of 77% according to educators and 83.21%. Based on these results, the data showed that the Android application using Transformative Learning Strategy as a Distance Learning on static fluid material is suitable media for learning physics.

Keywords: android application, transformative learning, distance learning, static fluid

INTRODUCTION

Education is the first step in the progress of the formation of the nation's generation. Based on Fatur and Yuliati (2014), education is considered a center of excellence in preparing exemplary human character. Education is a series of learning based on input, process, and reflection. Thus, that learning is a transformative process. According to Tony and Marcia (2015), in the learning process, there is collecting information process and creating internalization as a combination of what has been experienced, changing what is known and built based on what is done. Based on Saihu and Baeti (2019), transformative learning is a fundamental change in the learning process that affects long-term changes in the learner, resulting in a meaningful impact and can affect the next experience for learners. Based on Hardika (2014) in this transformative learning, it can increase student learning creativity both at the planning, implementation, and evaluation stages of learning, with the learning process taking place more dynamically, attractively, and fun. McGonical (2005) said several strategies for implementing transformative learning; the activating event, identifying current assumptions, encouraging critical self-reflection, encouraging essential discourse, and the opportunity to test a new paradigm.

In connection with the Development Education Strategy in Indonesia in 2014 - 2019, the government established lifelong education. Meanwhile, conceptually, the implementation of education in Indonesia still applies a centralized system that is centrally oriented, so that it has not been fully optimized for remote areas of Indonesia. Based on Taufik, Ali (2019) corona also related to outbreaks of viral disease that attacks the country of Indonesia in 2019, the Ministry of Education and Culture of

the Republic of Indonesia to change the learning process is carried out through the distance learning system. Distance Learning is the learners' education apart from educators and learning using various learning resources through communication technology, information, and media. (Depdiknas 2003)

Media as digital communication is marked by the birth of the concept of Electronic Learning (E-Learning). E-Learning is a form of teaching and learning that uses electronic circuits (computers, interactive Audio / Video CDs, LAN, WAN, or the internet) in delivering learning content, interaction, and guidance. (Asep 2020). The smartphone is an e-learning medium that provides the advantage of being grasped and easy to carry anywhere, for example is android. The android is user friendly, and people can use android to open sources (Abdillah et al. 2020). Digital communication is a learning medium to support the implementation of Distance Learning, but the component must be completed. The details are syllabus as lesson planning, digital learning orientation, teacher biographies and learner expectations, learning materials, calendars, site maps, and assessments as level gauges (Munir 2017).

Learning media that supports the implementation of Distance Learning needs to complete the characteristics of media that are used, such as having learning objectives are detailed, designed in small units, involving learners, media prepared in complete accordance competencies, there are exercises, allowing learners to synthesize, provide motivation to learn, varied and has a collection of open-ended questions (Moore & Kearsley 1996).

Learning media also need to be developed in understanding physics concepts, one of which is the concept of static fluids. Static fluid is a physical science that explains flow matter in stationary conditions, especially liquids and gases, and is related to the phenomena of everyday life. According to Dyahesita Qowiyyun P.A (2019) research, students' shared understanding of the concept of static fluids was only 25% due to the basic concepts of students who were still weak, causing misunderstanding higher level. This happens because the concept of physics is a concept that is interrelated with one another. Based on research Diyana Tsani N. (2020), there has been an increase. However, most students have difficulty understanding certain concepts, and students fail to describe the forces acting on specific objects in the fluid. As a result, they fail to determine the pressure ratio. Most students have difficulty in analyzing mechanically to relate physical phenomena to the concept of static fluids. The same mistakes every student makes can indicate misunderstandings that are hard to get rid of. So, it takes more effort to master the concepts of static fluid in-depth to have good reasoning ability (Nooritasari, Kusairi & Wisodo 2020).

The results of the analysis randomized in learners School (SMA) class X - XII for science using Google Forms obtained data collected on 2 to 9 September 2020 with 137 respondents brought. Based on the needs analysis, it is known that 100% of the 137 respondents. All students have smartphones, with 82% of 137 students, namely 113 students having Android smartphones, 17% of 137 students, namely 24 students owning Apple smartphones. The average of students who is learning physic with the Distance Learning system feels difficulty of understanding. Submission of materials that have not been utilizing instructional media allows for teacher difficulty in transferring the learning to learners, and students were difficult to understand the teaching is delivered.

Based on the above, this study aims to develop learning media in Android applications using transformative learning strategy to support distance learning on the static fluid material.

METHODS

The research used the research and development method. The research and development model used in this study is the Dick & Carey (2015) model, this Dick and Carey model is a research model oriented to the description of the steps descriptively, and each stage is interconnected, which has stages:

Identify Instructional Goals

The initial stage is to identify learning objectives in general based on the formulation of physics learning objectives which refers to Permendikbud No. 37 of 2018 which understanding, applying, analyzing factual, conceptual, procedural, and metacognitive knowledge based on his curiosity about science, technology, arts, culture, and humanities with insight into humanity, nationality, statehood and civilization related to the causes of phenomena and events, as well as applying procedural knowledge to specific fields of study according to his talents and interests to solve problems.

Conduct Instructional Analysis

Learning analysis that includes skills, processes, and procedures to achieve the learning objectives. At this stage, a basic competency analysis of 3.3 is carried out to determine the indicators of competency achievement and to produce ten indicators of competency achievement in static fluids.

Analyze Learners and Contexts

Analyzing learning by compiling a map of static fluid material that needs to be received by the learners so that they can develop their skills and achieve the learning objectives.

Write Performance Objectives

Formulate specific learning objectives by compiling materials to be developed in Android applications, such as Hydrostatic Law, Hydrostatic Pressure, Pascal's Law, Archimedes' Law, Surface Tension, Capillarity Symptoms, Meniscus Symptoms, and Viscosity.

Develop Assessment Instruments

Developed research instruments for Android applications, namely product feasibility testing instruments by material experts and media experts as well as testing instruments by high school students and physics teachers.

Develop Instructional Strategy

Developed a strategy of exposure of the material in the Android app. Android application that contains competencies along with achievement indicators, profiles, material, phenomena, simulations, inventors, sample questions and question exercises.

Develop and Select Instructional Materials

Develop and design learning materials in the form of Android applications. The first step is to compile the material to be developed and arrange other components such as the preparation of videos related to the material, the preparation of the inventor character and his inventions, practice questions and simulations related to static fluids, and then input in the MIT App Inventor software as an Android application designer software.

Design and Conduct Formative Evaluation of Instruction

Evaluated the product by testing the feasibility of the Android application by material experts and media experts. After that, the researchers did the field test for students of SMAN 109 Jakarta and physics teachers.

Revise Instruction

Revised the Android application improvements. The improvements of the application is based on the results of product feasibility evaluation, namely Android applications by media experts and material experts.

Preliminary analysis is done by distributing questionnaires through Google Form, which are shown in class X and XI science. Formative evaluation data from the validation test analysis questionnaire and field trials in this study. Material experts and media experts carried out the feasibility validation test, and field trials were carried out on teachers and students of class XI IPA at SMA Negeri 109 Jakarta. The qualitative data was obtained from the comments and suggestions in the questionnaire sheet test. Meanwhile, quantitative data is in numbers, namely 1, 2, 3, 4, and 5, based on a Likert scale,

then averaged and presented. Then do the analysis and measure the power level of the variables studied through a continuum line.

$$Score\ percentage\ = \frac{higest\ percentage - lowest\ percentage}{value\ scala} \quad (1)$$

TABLE 1. Scale Category (Akdon, 2007)

Scale		Category
20%	36%	Totally Disagree
> 36%	52%	Disagree
>52%	78%	Quite Agree
>78%	84%	Agree
84%	100%	Strongly Agree

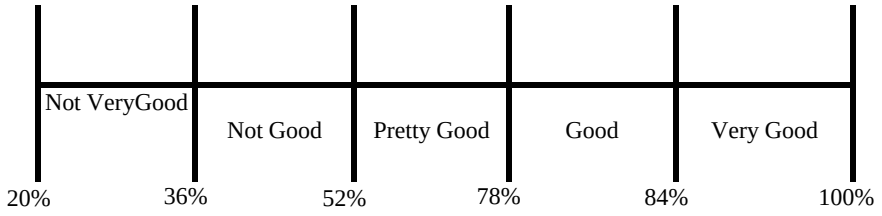

FIGURE 1. Continium Line

RESULTS AND DISCUSSION

The developed product is divided into two series, namely Static Fluid Part 1 and Static Fluid Part 2. Part 1 Static Fluid application contains competencies, profiles, materials, and sample questions, and in Part 2 Static Fluid contains competencies, profiles, simulations, inventor figures, and a collection of questions. The application developed using the Transformative Learning strategy is in Figure 2-Figure 12.

Cover Page

Cover as the main page of the application that attracts students and presents information about the material to be studied. The cover also functions as a page for the readiness of students to carry out the learning process.

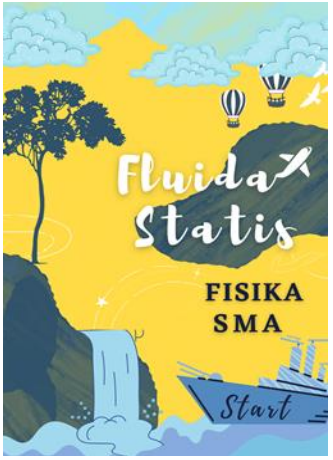

FIGURE 2. Cover Page

Menu

The menu shows a list of menus to be addressed in this application. This application contains a menu of profiles, competencies, simulations, question banks, and inventor figures.

FIGURE 3. Menu

Profil

The profile contains application developer self data.

FIGURE 4. Profil

Competence

This page shows the essential competencies and achievement indicators that are used as a reference for the success of the knowledge and skills needed in static fluid learning.

FIGURE 5. Competence

Material Menu

This page shows the list of materials presented in this application.

FIGURE 6. Material Menu

Concept Maps

This application is equipped with a concept map that displays the relationship between static fluid concepts.

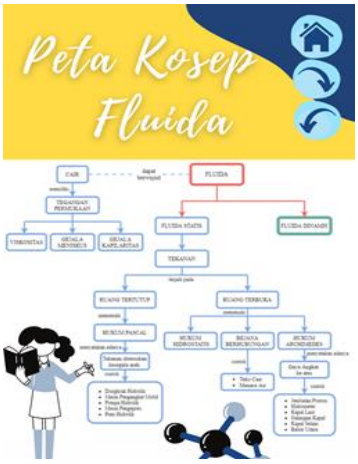

FIGURE 7. Concept Maps

Preface

This page contains fluid material, namely the definition and types of fluids, along with examples.

FIGURE 8. Preface

Theory

FIGURE 9. Theory

This material page is designed using the Transformative Learning strategy, namely:

1) Activating Event: Presenting a statement as a stimulus to create a disorienting dilemma for students.
2) Identifying Current Assumption: Directing and presenting media in the form of pictures, tables, and learning videos linked through the youtube channel. Explanations in the form of learning videos can guide students to explore new perspectives in understanding static fluid material and increase students' interest in learning.
3) Encouraging Critical Self-Reflection: Presenting statements can guide students to consider new perspectives from stimuli and learning videos.

Question Bank

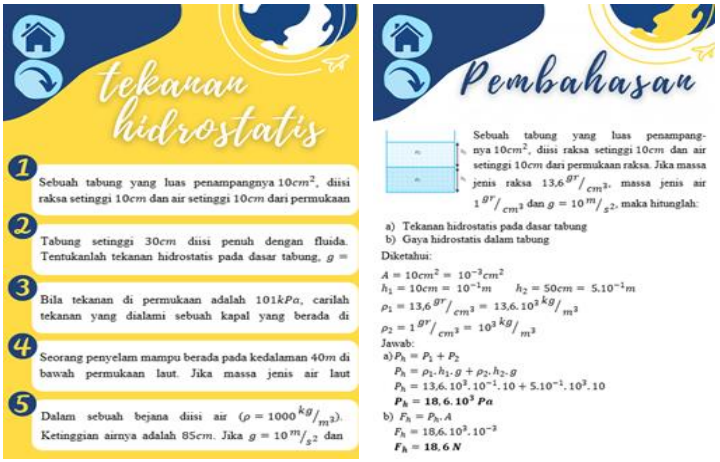

FIGURE 10. Question Bank

The question bank page is also designed using a transformative learning strategy by continuing the following steps, namely:

4) Encouraging Critical Discourse: Students can investigate new perspectives obtained from understanding the related material by presenting sample questions and practice questions. Sample questions and practice questions are equipped with discussions obtained from national exam questions.

Simulation

FIGURE 11. Simulation

This simulation page is also designed using a Transformative Learning strategy by continuing the following steps, namely:

5) Opportunity to Test New Paradigm: By presenting interactive simulations, directing students to emphasize new perspectives and follow up on understanding concepts so that students can view, understand and interpret the concept of static fluid with a more precise perspective.

Inventor Figures

Presentation of biographies of figures who discovered the concept of static fluid as well as various discoveries related to the concept of static fluid.

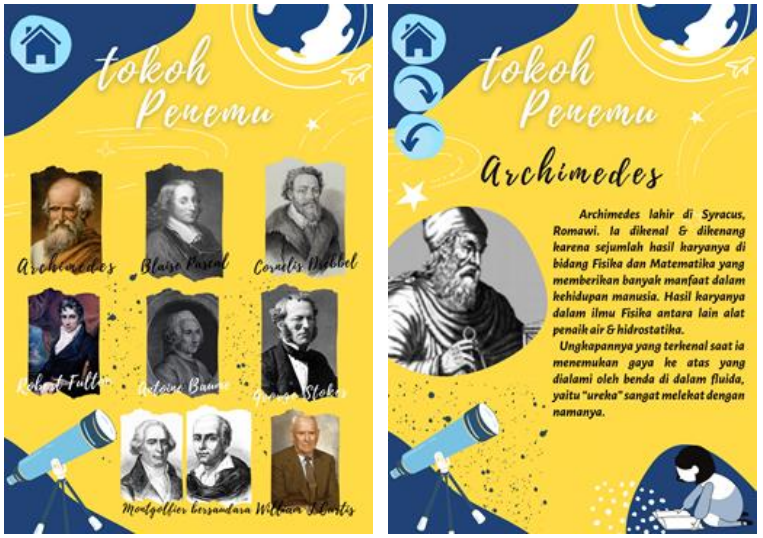

FIGURE 12. Inventore Figure

The design of learning media in the form of Android applications using Transformative Learning strategy, beginning by introducing a different perspective with which to understand so that learners experience the disorienting dilemma by loading the introductory statement about a concept. Then students will be encouraged to explore various assumptions by digging deeper into these different perspectives through videos that explain a concept. In this situation, students will question the basic assumptions they have to critically reflect on themselves by considering the understanding obtained from the available learning videos and a brief explanation of a concept. Then, students will be more understandable from many perspectives. To measure the student's comprehension, the researchers used different sample questions. After that, students began to be interested in using new perspectives, understanding, and interpreting learning by conducting simulations/experiments to finalize their new knowledge.

The results of the Android application product validation test by experts produce the following data:

TABLE 2. Product validation test results by material experts

Number	Rated Aspect	Interpretation
1	Exposure to Static Fluid Materials	92%
2	Presentation Techniques Android Application by Transformative Learning strategy	95%
3	The language used in the Android Application	100%

TABLE 3. Product validation test results by media experts

Number	Rated Aspect	Interpretation
1	Presentation Display Android Application	80%
2	Presentation language in Materials	80%

3	Android Application Component supporting Distance Learning	80%

Based on the validation test. The two experts who conduct the test, it was obtained an average percentage of 87.5% with a continuous interpretation of "Very Good", This is following the research results of Purbasari & Julia (2013), which states that the android application as m-learning can increase interest in learning by facilitating the implementation of Distance Learning and research by Abdul & Berti (2019) which states that the attractiveness of packaging material in the form of descriptions and audiovisuals can provide positive student responses.

Then, the results of the Android application field trials by physics teachers and students produced the following data:

TABLE 4. Product validation test results by teacher experts

Number	Rated Aspect	Interpretation
1	Exposure to Static Fluid Materials	80%
2	Android Application Component Supporting Distance Learning	74%
3	Language	72%
4	Transformative Learning strategy	80%

TABLE 5. Product validation test results by learning experts

Number	Rated Aspect	Interpretation
1	Exposure to Static Fluid Materials	85.07%
2	Android Application Component	79.00%
3	Language	85.56%

Based on field trials conducted by teachers and students obtained an average yield - average percentage of 80.11% with the interpretation of "Good", so that it can be a supporting medium in understanding the material. This is in line with Muyaroah & Fajartia's (2017) research that the feasibility of this learning media can also motivate students to understand concepts easily and quickly.

This application can be a development in terms of content because it has completed similar applications (Muliyati et al. 2021). Based on the results of the validation test, it shows that the Android application on the static fluid material developed is suitable as a learning medium. Although the weakness in this study does not measure how far the transformative learning aspect of each individual is. Given that transformative learning, the theory is an adult learning theory that focuses on how individuals and groups change. This theory involves achieving new meaning by changing individual attitudes, beliefs, and assumptions through critical reflection (Yıldırım & Yelken 2020). But this application is suitable to be used as a support for learning physics in the implementation of Distance Learning. In addition, this application can be used as an alternative in learning physics independently by students who are not bound by space and time.

CONCLUSION

Based on the results of validation tests by material experts and media experts as well as the results of field trials by high school educators and students, it can be concluded that the Android application using Transformative Learning strategies on static fluid material is suitable for use as a learning media supporting Distance Learning.

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REFERENCES

Abdillah, AJ, Rany, TD, Kuswanto, H, & Riyadi, I 2020, 'Implementation of physics learning media based on android integrated earthquake disaster education to enhance problem solving abilities and natural disaster preparedness', *J. Phys.: Conf. Ser.*, vol. 1440, p. 012027.

Abdul, UL & Berti, Y 2019, 'Pengembangan Aplikasi berbasis Android yang Terintegrasi dengan Website sebagai Media Pembelajaran Biologi', *Jurnal Bioterdidik*, vol. 7, no. 5, pp. 33 - 42.

Akdon, R 2007, '*Rumus dan Data dalam Apikasi Statistika*', Alfabeta, Bandung.

Ali, T 2019, 'Perspektif Tentang Perkembangan Sistem Pembelajaran Jarak Jauh di Kabupaten Kutai Kartanegara Kalimantan Timur', *Jurnal Pendidikan Riset dan Konseptual*, vol. 3, no. 2.

Asep, H 2020, 'Mengenal E-learning', *Retrieved from IPI*, Viewed 5 April 2020, http://www.ipi.or.id/elearn.pdf

D, DN, S, K & H, W 2020, 'The Exploration Of Mechanistic Reasoning Ability For High School Students In Static Fluids', *Journal of Physics: International Conference on Sciece Education and Technology*.

Depdiknas 2003, '*Undang-undang RI No.20 tahun 2003 tentang Sistem Pendidikan Nasional*', Balitbang, Jakarta.

Fatur, R, Hum, M, S, A & Yuliati 2014, 'Character Education For Golden Generation 2045 (National Character Building for Indonesian Golden Years)'. *Procedia - Social and Behavioral Sciences*, vol. 141, pp. 1161-1165.

Hardika 2014, 'Model Pembelajaran Tranformatif Berbasis Learning How To Learn untuk Peningkatan Kreativitas Belajar Mahasiswa', *Madrasah*, vol. 6, no. 2, pp. 12.

McGonical, K 2005, 'Teaching for Tranformation: From Learning Theory to Teaching Strategy' dalam Newletter', *Center for Teaching and Learning*, vol. 14, no. 2.

Moore, M & Kearsley, G 1996, '*Distance Education: A System View*', Wadsworth Publishing Company, Belmont.

Muliyati, D, Rahmah, A, Sunaryo, and Susanti D 2021, 'The development of Android-based physics teaching materials on static fluids', *AIP Conference Proceedings*, vol. 2331, p. 030038.

Munir 2017, '*Pembelajaran Digital*', Alfabeta. Bandung.

Muyaroah, S & Fajartia, M 2017, 'Pengembangan Media Pembelajaran Berbasis Android', *Innovative Journal of Curriculum and Educational Technology*, vol. 6, no. 2, pp. 79-83.

Purbasari & Julia, R 2013, 'Pengembangan Aplikasi Android sebagai Media Pembelajaran Matematika pada Materi Dimensi Tiga untuk Siswa SMA Kelas X', *Jurnal Online Universitas Negeri Malang*, vol. 1, no. 4.

Qowiyyun Dyahesita, PA, A, W 2019, 'Analisis Pemahaman Konsep Fisika Siswa Pada Pokok Bahasan Fluida Statis', *Jurnal Ilmu Fisika dan Pembelajaran*, vol. 3. no. 2.

Saihu & Baeti, R 2019, 'Pembentukan Karakter Melalui Model Pendidikan Transformasi Learning Pada Santri Di Pondok Pesantren Nurul Ikhlas Bali', *Pendidikan Islam*, vol. 8, no. 2.

Tony, B & Marcia, C 2015, 'The New Social Learning', *2nd Edition: Connect Collaborate*, Work. ATD Press, New York.

Tsania Nur Diyana, SS 2020, 'The Analysis of Student Difficulties in mastering static fluid concept', *Momentum: Physics Education Jurnal*, vol. 4, no. 1, pp. 11-18.

Yıldırım, M & Yelken, TY 2020, 'The Development of Transformative Learning Scale for Information and Communication Technologies', *Tech Know Learn*, vol. 25, pp. 989–1006.