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Development of E-Worksheet Using Using Android Educapps Application for Economic Learning

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ABSTRACT

This study aims to develop an e-worksheet on learning and teaching economics using android educapps application. The method used was research and development through the ADDIE model. The data were collected through questionnaires, interviews, and documents. The implementation of the product trial was carried out at State Senior High School 2 Kendari with 50 students. The data obtained were analyzed qualitatively through the results of assessments from experts, the results of product trials and the use of t-tests on the assessment of the results of electronic worksheets that had been done by students during the large product test. The results of the product assessment showed that 89.14% of all aspects of the e-worksheet have been feasible and this percentage was the very good category. The assessment of IT experts showed that aspects of software engineering and aspects of visual communication received a score of 79.94%. The results of the material expert assessment concluded that all aspects of content feasibility, presentation feasibility aspects and language assessment aspects received a score of 91.5%. Based on this assessment, the educapps application was declared eligible as an economics learning e-worksheet for class XI at State Senior High School 2 Kendari. The results of the study have implications for teachers' understanding of the development of e-worksheets and teaching materials that can be harmonized with technological developments so that learning can be in accordance with the needs of today's global education.

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1. INTRODUCTION

Student worksheets are important part of the teaching and learning process. Worksheets are like bread and butter in the teaching process. The existence of this worksheet can provide provocation to students to fill time with learning activities and keep the class busy. This worksheet becomes a tool used by students to learn and an aspect that is part of the teacher's role in the classroom by the standards set in achieving learning objectives (Barton, 2015). Worksheets are also one of the complementary media for teaching materials used to determine students' understanding of the material they have learned. Moreover, current technological developments have also been widely used as material for student worksheets. It means that the use of teaching materials and student performance assessment sheets has used technology applications a lot. Nowadays the mindset of teachers must be changed to include the idea that "teaching is not effective without the proper use of information and communication technology (ICT) resources to facilitate student learning" (Ertmer & Ottenbreit-Leftwich, 2010). So, it can be concluded that worksheets are useful for evaluating student performance media, so that teachers can find out student learning progress. The form of the created worksheet can involve the application of technology.

The fact also shows that technology plays a much bigger role in the digital era than in previous generations and has made the current generation have a high level of technological literacy. The mastery of technological literacy has been widely used in the implementation of education (Hashim, 2018). Therefore, student worksheets can also be designed with technology applications that are easily accessible and used by students. Design innovations in worksheets need to be developed so that students are motivated to follow the learning process that can be developed with Augmented Reality technology (Kharisma, Syafii, & Zulfarina, 2020; Sumardani et al., 2020; Bakri, Ervina, & Muliyati, 2019). So it can be concluded that teachers must be aware of technological developments that have been used in education and they can innovate to make types of worksheets using technology.

Education in the era of the industrial revolution 4.0 has a curriculum that utilizes the internet of things (IoT) as a source of media in the learning process. Learning media that support this is an e-worksheet with a crossword game that will help students be motivated in the learning process (Fina, Raharjo, & Purnama, 2022). Student worksheets can improve the quality of learning processes and good learning outcomes (Hardayanti, Nurhayati, & Suhendi, 2019; Nanto, Aini, & Mulhayatiah, 2017). Electronic student worksheets can be used not only for distance learning classes but can improve students' creative thinking skills (Dermawan & Andartiani, 2022; Payudi, Ertikanto, Fadiawati, & Suyatna, 2017) and higher-order thinking (Fitriani, Bakri, & Sunaryo, 2017). It even has a potential effect on students' critical thinking skills (Fitriana, Yusuf, & Susanti, 2016). Wiganingrum, Serevina, & Budi (2019) has developed learning media in the form of student electronic worksheets equipped with guided discovery-based animated videos that are suitable for use to support the learning process. Thus, worksheets that are designed based on multimedia are variations of teaching materials that provide positive learning for students (Titin, Ganda, Panjaitan, & Widiyatmoko, 2022). From some of these studies, it can be seen that worksheets designed using technology applications have a positive impact on student learning desires. The achievement of their learning outcomes is better and has a positive influence.

The results of previous studies concluded that worksheets are interesting to study. However, this study offers a different concept from previous research, because this research is oriented towards developing an e-worksheet by using an android application so that the results of this worksheet can be downloaded and used by using a smartphone. Students can complete their learning performance not only in class but they can access the worksheet and work on it anywhere. The reasons for this development research were 1) the use of technology for continuous teaching and learning from previous online learning activities, 2) Students feel ineffective using exercise worksheets in the form of printed sheets of paper, 3) the teachers have not developed worksheets based on technology applications even though the students used smartphones to do the exercises.

Thus, the purpose of this study was to develop an e-worksheet on learning and teaching economics by using the android educapps application. The results of this study were expected to contribute to the development of teaching materials. Teachers can understand the use of advances in technological applications to design electronic worksheets.

2. METHODS

This study used research and development through the ADDIE model. R & D is a research method used to find or develop an effective, efficient and meaningful product. In this case, development research can be oriented to existing and developed products or create new products that have been carried out through a series of scientific and testing stages (Creswell, 2012). The ADDIE method consists of five main stages, namely analysis, design, development, implementation and evaluation, which are described as follows;

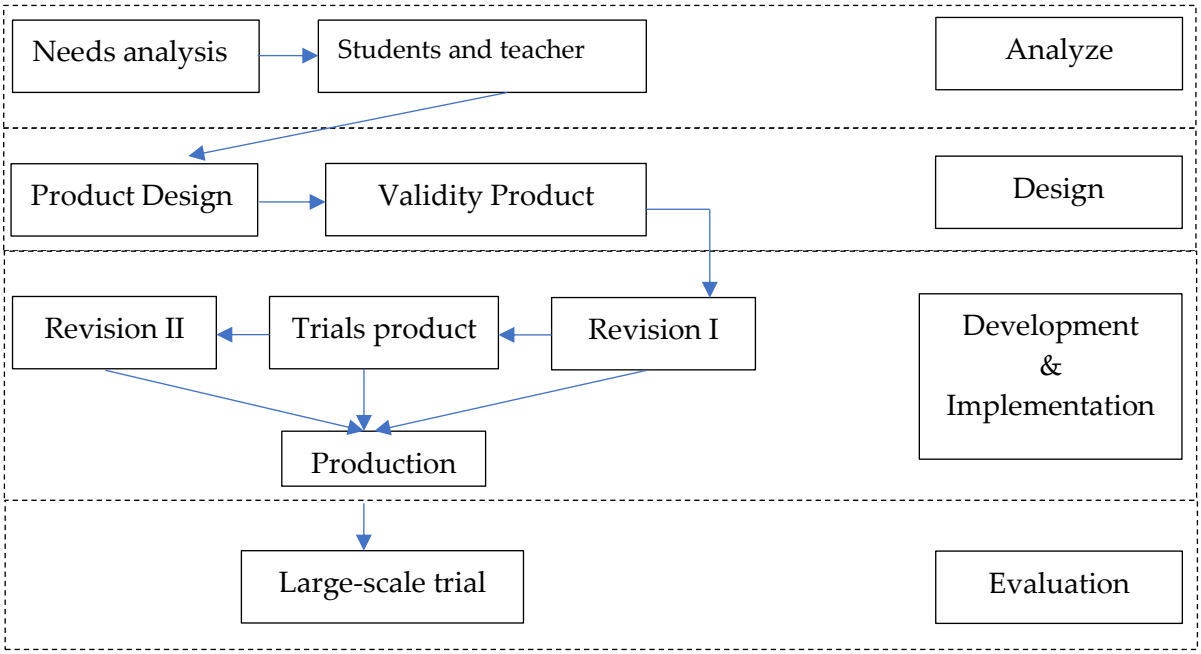


Figure 1. The procedure of research adapted ADDIE model

The first stage was the stage of collecting information that can be used as material to make products, in this case, the resulting product was an Android application-based E-Worksheet. This information collection was in the form of an Analysis of Student Needs and Characteristics.

a. Needs analysis was carried out to determine the availability of teaching materials that support the implementation of learning.
b. The characteristics of the students' e-worksheet were carried out so that the E-Worksheet was developed by the needs of the students.

The second stage was design of product based on the needs analysis. The steps for preparing the design were as follows:

a. Product Design begun with determining the application to be developed. The application consists of 3 parts were: 1) Introduction, 2) Material, and 3) Online Test.
b. Design Validation. The products that had been developed were then validated by IT experts and one economics teacher as material and curriculum experts.

The third stage was development stage. It was the stage of realizing what hadbeen made in the design stage to become a product. The stages were as follows:

a. Revision I. After the product was validated by colleagues, then the researcher made revisions to improve the product developed on the suggestions or comments given by the validator.

b. Product Trial. After the product was validated and revised then the product was tested on a limited basis to determine the response to the product given to a small class with a total of 25 students.
c. Revision II. The final revision was then carried out if there were suggestions and comments from students.

The fourth stage was final revision of the product that had been developed is suitable for use, then production is carried out. The wide-scale trial was carried out after the production was carried out by taking 50 students of class XI Social Sciences at the State Senior High School 2 Kendari. The participants were taking randomly.

This research was conducted in the even semester of the 2021/2022 academic year in January - June at State Senior High School 2 Kendari. This was based on the need for developing electronic student worksheets that have not been provided by the school due to limited human resources and facilities. Techniques of collecting the data by using;

1. Questionnaire

This tool was used for needs analysis related to research problems given to students and teachers, as well as product validity testing given to IT experts and using materials and curriculum. The initial product of student worksheets based on android applications on international trade materials had been validated by IT experts, relating to the construction and language of the media to be validated. This media assessment used the Rating Scale. Rating Scale was the raw data obtained in the form of numbers and then interpreted in a qualitative sense. On the rating scale, the rater gave a number to a continuum where the individual or object was placed. In the Rating Scale model, respondents did not answer from the available qualitative data but answer from one of the quantitative answers that had been provided. This criterion was the answer to the instrument item along with the score given by the respondent to test the validity of IT media experts, materials and curriculum experts. It was hoped that this scale can be used as a reference to make it was easier for the validator to provide an assessment. The questionnaire scale table can be seen as follows:

Table 1. Scale for Expert Validity

Items instrument	**Score**
Very Good	5
Good	4
Enough	3
Less Good	2
Not Good	1

This questionnaire was compiled based on the criteria made for IT experts, material experts, and students with different questionnaires according to their respective functions and interests. The questionnaire had also been validated by experts so that the level of reliability and trustworthiness of the questionnaire can be used properly. The questionnaire grid was as follows:

a. Indicator items questionnaire for IT expert
    1. Software engineering aspect: 1) Application installation, 2) Error test, and 3) operation on android device
    2. Visual communication aspect: 1) user interface, and 2) App View.
b. Indicator items questionnaire for students
    1. Software engineering aspect: 1) application installation, 2) error test, and 3) operation on android device.
    2. User interface (UI) design aspects: 1) user interface, and 2) App view.
    3. User experience aspects: 1) appearance, and 2) material presentation.
c. Indicator items questionnaire for Material and Curriculum expert; 1) content feasibility aspect, 2) feasibility of presentation, and 3) language assessment.

2. Interview. It was used to know the students' background, especially about e-worksheet and also to discuss with the expert to know the feasibility of the product. Interviews also were conducted during product trials to students. The interview asked about the application of software engineering, user interface design, and user experience.
3. The document was taken from the result of learning and teaching especially electronic worksheets.

The data obtained were analyzed qualitatively through the results of assessments from experts, the results of product trials and the use of t-tests on the assessment of the results of electronic worksheets that had been done by students during the large product test. The results of the expert assessment of the products that have been developed refer to the feasibility scale which is converted to the following percentages (Arikunto, 2010);

Table 2. The scale of Product Feasibility

Score	Criteria
81 – 100%	Very Good
61 – 80%	Good
41 – 60%	Enough
21 – 40%	Less
< 21%	Not Good

The assessment of the development of E-worksheet based on the educapps android application is determined with a minimum percentage of 21%. So, if the average percentage of material experts, media experts, and student responses gets a score of 61%, then this E-worksheet based on the educapss android application is declared feasible.

3. FINDINGS AND DISCUSSION

3.1 The Result of Needs Analysis

The results of the needs analysis from the questionnaire that was distributed to students and teachers as well as interviews found several conclusion points related to the e-worksheet they needed and wanted, namely;

a. The worksheets used so far are still manual or conventional because the exercises and materials provided are still written on the blackboard or in PowerPoint form that is displayed using an LCD.
b. The learning media used is still not suitable for learning needs.
c. The form of the worksheet given is often a sheet of paper that is given to students to do in class or at home
d. Students are often asked to do exercises or present a summary of the material in a handwritten book.
e. Students need an application that can be accessed via smartphones to do the exercises and study the material so that students do not have to bring the books
f. Students want to learn economic subject by using applications on smartphones.
g. Students need performance sheets that are not only in the form of text but also have pictures and are coloured so that they are interesting and eliminate boredom.
h. Students need an application that can provide simultaneously worksheets and teaching materials

From the results of exposure to these findings, the worksheets needed by students are related to technology applications that can be accessed via smartphones or laptops. Thus, students can still access the learning material at home, anytime and anywhere. Moreover, the access to technology applications has been widely used as a learning resource for students.

3.2 Design of Product

The results of the needs analysis have been used to design e-worksheet products. In the design process, user interface design and user experience applications are designed which consist of making storyboards, making logos, backgrounds, menu icons, and navigation buttons that will be used.

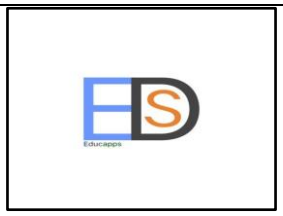
a. Storyboards. The storyboard provides an overview that contains the entire Educapps android-based application component which will be loaded in an application format (APK) file. The storyboard serves as a guide to make it easier to understand the application creation process. The storyboard of this application is shown in the attachment.
b. Creation of the Educapps application logo. The logo used as the identity of the Educapps application when published on the Play Store uses a logo created by the researcher himself.
c. Background. The background or colour used in the display background of the Educapps application is a hex blue colour. To enter this colour into the Educapps application component, the researcher used the colour code #0C87F2 in the juggle jack software at the design stage.
d. Menu icons and buttons. The resource for the icon on the menu in the Educapps application is downloaded via the internet on the website https://pngtree.com, then designed by the researcher using pixel lab software according to the creativity of the researcher to attract the attention of users who are none other than the students themselves.
e. The navigation buttons in this application are templates and juggle jack software consisting of several types, namely: Top Navigation, Bottom Navigation, Left Navigation, List, Grid, List Slider, Grid Slider, Flex, and Flex Slider. And in the Edkataps application, the button used is the Flex Slider Navigation button

3.3 Development and Implementation of Product

In this process, the product in the form of an Android-based application that is designed is codenamed " Educapps " and the product name is Educapps which is used as an identity during the publishing process on the PlayStore. After collecting all the required resources, the researcher assembled all the components into one using several main supporting software, namely JUGGLE JACK to compile and create APK files and set the UE display, PIXELLAB Software to design the UI display and splash screen design and pop up display when the application opened. In addition to software, the menu icon features and buttons in this application are obtained from the pngtree.com website and partly from google material arts. The first step in making this product is to determine the logo that will later become the identity of this application when published to the Playstore. The logo on the Edkataps application was chosen and designed by the researchers themselves, this was done by the researchers to make it easier for users when looking for applications on the Playstore.

The following is a product development design:

Table 3. Development Product Design

	Name	Picture	Information product
1	App Logo		1. Educapps: stands for Education Application which means educational application. 2. Blue (Letter E): this colour was taken because according to psychology, blue is defined as a colour that leaves the impression of peace and tranquillity. 3. Black (Letter D): black does not always have a negative meaning, namely darkness. This black colour from a positive point of view can be interpreted as an elegant and classic impression according to fashion/appearance.

4. Orange Color (Letter S): why this colour was chosen because the colour orange according to psychology is defined as a colour that brings a creative impression.

2	Educapps Home	 	1. In the initial display menu, there are two options that the user can choose, namely the LOG-IN and REGISTER menus. If the user does not have an account, the user can select the "Register" button first to create an account and if the user already has an account, the user can select the Login button by entering the registered Email and Password. 2. On the REGISTER menu, the user must fill in the requested data correctly so that the account registration process is successful. The requested data is in the form of Name, Username (name with numbers that the user can create independently, for example, julia08), Email, mobile number, and Password.
3	Main Menu		On the main screen, 2 sections will be displayed, namely Introduction, Materials, Online Tests and Help (bottom centre). then there are Security, Chat, and Account Settings features (top right). The introductory view explains what an E-Worksheet is all about. Which reads “Hi, welcome to EDUCAPPS. We are an E-Worksheet that will help you achieve your learning goals”. The Learning Materials menu contains the contents of the material that will be studied by the user, namely International Trade material. This international trade material is divided into several sections, namely: Benefits of International Trade, Drivers of International Trade, Barriers to International Trade, International Trade Theories, Objectives and Policies of International Trade, International Payment Instruments, International Balance and Foreign Exchange.
4	Menu Test		In this menu, users who want to work on the questions must first fill in the personal data that has been provided in the question test column consisting of Name and Class.

5	Help Feature		This feature is a Help Feature where if the user experiences problems in the application, they can contact the listed contact.
6	Chat Feature		The function of this Chat feature is to make it easier for users to communicate with the application admin when something is not understood
7	Setting Account		This feature allows users to edit profile photos and usernames, and log out of accounts.

The validation stage aims to assess the suitability of the product design to the needs. Validation was carried out by validator experts, so the validator's input was used to revise parts of the E-Worksheet that were not good. The revision of the E-Worksheet based on the educapps android application was carried out until it was declared feasible by the experts, after being declared feasible by the experts, the E-Worksheet based on the educapps android application can enter the field trial stage to get responses from students. The score data generated by IT experts and material experts can be seen as follows:

1. IT expert

IT experts focused on assessing all aspects of the application, from software engineering to visual communication. The IT expert who validated this android-based application was Mr LM. Fid Aksara, S. Kom., M. Kom. He is the Secretary of the Department of Informatics Engineering, Faculty of Engineering, Halu Oleo University. The results of the validation of the educapps android-based application complete with information from IT experts can be seen in the table below.

Table 4. Software Engineering Aspect Assessment Data by IT Experts

Component of Assessment	Indicators of Assessment	Score (Average)
Application Installation	1. The application file size is not large	0,8
	2. The application installation process is done easily	0,6
	3. This application has clear application instructions	0,6
	4. The account registration process is clear and easy to do	0,8
Error Test	1. The application does not run slowly	0,8
	2. The application does not cause the cellphone to force close	0,8
	3. The application does not cause the cellphone to hang (stop)	0,8
	4. The application does not hang (stop) during operation	0,8
Application operation on android device	1. The operation of this application is simple	0,8
	2. Applications can be run on various types of Android phones	0,8
	3. This application has a clear problem to help	0,4
	4. This application has a clear overview of the program flow	0,4
	5. This application provides an icon that makes it easy for users	0,8

	to operate it		
		Items Score	46
		Maximum Score	52
		% Score	88,46%
		Note	Very Good

Table 4 shows the IT Expert's assessment for the Software Engineering aspect, the percentage score is 88.46%, and then the average percentage score is included in the Very Good category.

Table 5. Assessment of Visual Communication Aspects by IT Experts

Component of Assessment	Indicators of Assessment	Score (Average)
User Interface	1. Users can interact with the application	0,8
	2. Creative in expressing ideas and ideas	0,6
	3. Right in choosing the logo that was made	0,8
	4. The display used in the application is interesting	0,4
Font and Color	1. The colour that appears in the application is correct	0,6
	2. Writing can be read well	0,6
	3. Notifications appear in the display	0,4
	Items Score	20
	Maximum Score	28
	% Score	71,42%
	Note	Good

While the recapitulation of the IT expert assessment is the following;

Table 6. Recapitulation of IT Expert Assessment

Aspect	Items Score	Maximum Score	%	Feasibility
Software engineering	46	52	88,46%	Very Good
Visual Communication	20	28	71,42%	Good
Total	66	80	159,88%	Good
Average			79,94%	Good

Based on the table above, it can be seen that the results of the IT expert's assessment of the Educapps Android-Based Application showed that the score for the Software Engineering Aspect obtained an average score of 88.46% where the average percentage score was included in the Very Good category. In the Visual Communication Aspect, it obtained a score of 71.42% and the average percentage of the score was included in the Good category. If all aspects are converted, the average percentage of the overall score is 79.94%, this means that the validation score by IT experts in this study is in a Good category.

2. Material Experts

Material experts focused on assessing the content of the material content and worksheets contained in the application. The material expert who validates this is an economics subject teacher. Aspects assessed by material experts include aspects of content feasibility, aspects of presentation feasibility, and language assessment.

Table 6. Assessment of Content Feasibility Aspects on Material Experts

Component of Assessment	Indicators of Assessment	Score (Average)
The suitability of the material with the Basic Competencies	1. Completeness of materials	0,8
	2. Material display	0,8
	3. Material depth	0,6
	4. The suitability of the material with the learning objectives	0,8

and learning objectives			
	1.	Concept and definition accuracy	0,8
Feasibility of	2.	Clarity of learning topics	0,8
Material	3.	The truth of the material concept in terms of scientific aspects	0,8
Supporting	1.	The relationship of the material with the conditions in the surrounding environment	0,6
Learning Materials	2.	Interesting material with learning design	0,8
	3.	Encouraging to seek further information	0,8
		Items Score	38
		Maximum Score	40
		% Score	95%
		Note	Very Good

The results of the validation of the content feasibility aspect can be seen in table 4.5. Data analysis in table 6 states that the content feasibility aspect is included in the very good criteria with an average percentage score of 95%.

Table 7. Assessment of the Feasibility Aspect of Presentation to Material Experts

Component of Assessment	Indicators of Assessment	Score (Average)
Presentation Techniques	The presentation sequence	0,6
Presentation Support	1. Student engagement	0,8
	2. Material quality	0,8
		0,8
Completeness of Presentation	**1.** Completeness of materials	0,6
	2. Introduction section	0,8
	3. Contents section	0,8
	4. Chat section	0,8
	5. Online test section	0,8
	Items Score	29
	Maximum Score	32
	% Score	90,62%
	Note	Very Good

The results of the material validation of the presentation feasibility aspect can be seen in table 4.6. The data analysis in table 7 states that the presentation feasibility aspect is included in the very good criteria with an average score of 90.62%.

Table 8. Assessment of the Language Assessment Aspect

Component of Assessment	Indicators of Assessment	Score (Average)
Straightforward	1. Language breakdown	0,8
	2. Sentence effectiveness	0,6
	3. The standard of words	0.8
	4. The accuracy of sentence structure	0,6
Communicative	1. Message readability	0,8
	2. The accuracy of the use of language rules	0,8
	3. Student involvement	0,6
Dialogue and interactive	1. Material accuracy	0,6

	2. The integration of students into the material	0,8
	3. Ability to encourage critical thinking	0,6
	Items Score	35
	Maximum Score	40
	% Score	87,50%
	Note	Very Good

Data analysis in table 8. states that the language assessment aspect is included in the very good criteria with an average score of 87.50%.

Table 9. Recapitulation of Material Expert Assessment

Aspect	Items Score	Maximum Score	%	Feasibility
Content Eligibility	38	40	95%	Very Good
Serving Eligibility	29	32	90,62%	Very Good
Language Assessment	35	40	87,50%	Very Good
Total	102	112	273,12%	Very Good
Average			91,5%	Very Good

The following are the results of a summary of comments and suggestions given by IT experts after the application assessment and the corrective steps taken, namely adding a help menu to the application so that problems do not occur in the application. Then the input and suggestions are used to improve/revise the application to match the views of IT experts.

Initial Product Revision Product

Picture 1. The Revision Product

3.4 Evaluation of Product

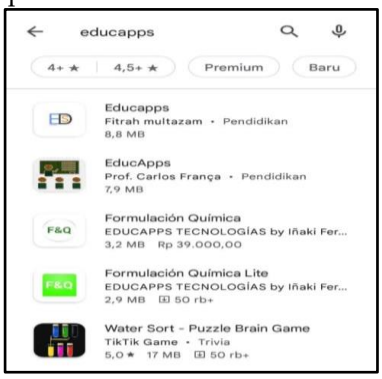
The results of large group trials were carried out in class, then students were asked to respond to a questionnaire that had been distributed. The results of the student assessment are:

Table 10. Students' Response After the Large Trial

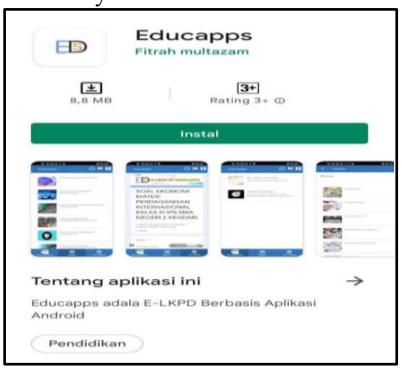
Component of Assessment	Indicators of Assessment	Score (Average)
Software Engineering Aspect	5. The application installation process is done easily	94
	6. Does it have clear installation instructions	91
	7. This app is available on PlayStore	
	8. Does not hang (stop) during operation	100
	9. The application does not cause my cellphone performance to be disrupted	89
	10. The application does not cause the phone to hang (stop)	81
		93

Aspects of User Interface (UI) Design	**1.**	The icons on each feature in the application are very clear	92
	2.	The icons used in the application can briefly describe the features	93
	3.	The entire display in the application is easy to understand	84
	4.	The overall appearance of the application looks attractive	82
	5.	The language in the application is very communicative and I can understand it well	92
User Experience (UE) Aspect	**1.**	This application can meet my needs	85
	2.	The features in the application make it easier for me to work on questions	82
	3.	This is my first experience using an application from E-LKPD Educapps	90
		% Score	89,14%
		Note	Very Good

After the entire program has become a unified whole in the APK file, (a file in the form of an application that can be installed on an Android device), the next step is the process of uploading or publishing it to the Playstore. In making it easier for developers or application development and Android users, Google provides a software store, namely Playstore. Playstore itself is a default application that is installed in all smartphone brands that use the Android operating system, because of this, researchers chose Playstore as a market to distribute. The following is the appearance of the Edkataps application that has been successfully uploaded to the Playstore.



Picture 2. Educapps Application in PlayStore



Picture 3. Educapps App

This educapps android-based application is the final product that can be used by students using an android smartphone. The educapps android-based application is relatively easy to operate because it has been adapted to operational standards for android applications in general. The educapps android-based application has advantages and disadvantages. The advantages of this application include as following:

a. This "educapps" application is an application whose download size is very small (under 10MB), which makes it very easy for users in the installation process. Based on research conducted, the majority of respondents stated that the educapps application did not make the smartphone slow.

b. The features contained in the application have been adapted to the student's needs. This is by the research questionnaire on the EU aspect.
c. The educapps android-based application has a simple design so it doesn't look complicated when used.
d. It is available on the PlayStore, making it easier for users to carry out the installation process

The disadvantages of this application include:

a. The educapps android-based application relies heavily on an internet connection to be used, if the network is unstable then the application may error although this is not always the case.
b. It has not fully covered all student needs in terms of features in this application.

The limitations in developing E-Worksheet based on the educapps android application include:

a. This application is an initial product, that's why the application that has been made does not contain many features and still needs development in the future.
b. The determination of product feasibility in this study is limited to aspects of Software Engineering and Visual Communication. The statement of eligibility for new application media is limited to one IT Expert.
c. The application media developed is limited in time and the capabilities of the researcher, so it cannot be said to be perfect as an application.
d. The trial conducted on this application is an open trial which is very likely to cause errors that are felt by the user, the open trial was chosen by the researchers because this type of trial is the easiest to do when compared to closed trials and internal trials.
e. Research is focused on the function of the application, not on the features contained in the application.
f. There are only a few features tested by researchers.

This finding illustrates that technology has been widely used as a learning resource many previous researchers have developed various applications for student material resources that can be accessed in the classroom or at home. However, this study presents a different orientation because the design of technology applications for e-worksheets is equipped with the material in advance for practice menus or online tests. Thus, students can study the material before taking the test. Moreover, this application is designed with a low size so that it does not interfere with smartphone applications or make the smartphone slow to access or open applications. It means that mobile technology opens new avenues for teaching and learning in schools in the 21st century so that it can help improve student achievement and learning (Etcuban & Pantinople, 2018)

The display presented is also simple which has an impact on usage. Students do not find it difficult to use this application. The results of other studies show that online learning based on android applications is a very helpful tool in maximizing teaching and learning activities (Indiati, Supandi, Ariyanto, & Kusumaningsih, 2021; Suci, Hobri, & Murtikusuma, 2019), and critical thinking (Damarjati & Miatun, 2021; Widiyatmoko, Utaminingsih, & Santoso, 2021; Puspita & Dewi, 2021). So, today's electronic worksheets are aligned with the needs of 4C skills and teach digital literacy in the 21st century (Maulana & Sopandi, 2022). It can also increase learning quality (Fikri & Ramdanil, 2021).

From the findings and previous research, it was shown that the application of technology had a positive impact on student achievement. This can be seen from the findings related to the more efficient use of e-worksheets. Students find it easier to do assignments or exercises and also understand the material because they can access the performance sheet through their smartphone. So, e-worksheet development research has a feasibility and efficiency level that can be applied in the classroom. This e-worksheet can also be used in other study programs by adjusting the content of teaching materials and exercises. However, the use of technology applications can be the same. This finding is in line with the current trend of globalization and the development of information technology which has pushed the new Merdeka Learn curriculum, Merdeka Campus, which has

become a universal issue in higher education in several universities in Indonesia (Rohiyatussakinah, 2021)

4. CONCLUSION

The result of study concluded that the model of e-worksheet was effective to use in the class. It can increase the students' achievement in economic learning. This e-worksheet has been designed according to the needs and abilities of students to access on their smartphones and is used as a variation of the learning process. From the results of the assessment on the test, it shows that overall Software Engineering, User Interface Design (UI) and User Experience (UE) Aspects, obtained a percentage with an average score of 89.14% included in the very good category. The results of the overall assessment of students involved in the open trial were 25 respondents showing a score of 89.14% for all aspects of the assessment, namely Software Engineering Aspects, UI Design Aspects, and EU Design Aspects. The reference percentage of this assessment shows in the very good category or can be said to be effective.

The product resulting from the development of an e-worksheet in the form of an android-based application for economic learning for students in high school is "Educapps" which is used as an identity during the publishing process. The product design shows the navigation buttons in this application are templates and juggle jack software which consists of several types, namely: Top Navigation, Bottom Navigation, Left Navigation, List, Grid, List Slider, Grid Slider, Flex, Flex Slider, and Play Store.

This research also has implications for teachers' understanding of the fulfilment of teaching and learning facilities such as teaching materials and student worksheets. Teachers can also innovate on aspects of technology that are learning media. The results of this study can also be further developed by further researchers related to the features and content of the material. Researchers can also develop a variety of student worksheets related to the overall material being taught and can expand product trial samples so that the results of this product can be used by high schools more widely.

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REFERENCES

Arikunto, S. (2010). *Dasar-Dasar Evaluasi Pendidikan*. Jakarta: Bumi Aksara.

Bakri, F., Ervina, E., & Muliyati, D. (2019). Practice the higher-order thinking skills in optic topic through physics worksheet equipped with augmented reality. *AIP Conference Proceedings*, *2169*. American Institute of Physics Inc. https://doi.org/10.1063/1.5132641

Barton, G. (2015). *Teach Now, Essentials of Teaching*. Oxon: Routledge.

Creswell, J. W. (2012). *Research, educational planning, conducting, and evaluating quantitative and qualitative research*. London & New York: Pearson Education.

Damarjati, S., & Miatun, A. (2021). Pengembangan Game Edukasi Berbasis Android sebagai Media Pembelajaran Berorientasi pada Kemampuan Berpikir Kritis. *ANARGYA: Jurnal Ilmiah Pendidikan Matematika*, *4*(2). https://doi.org/10.24176/ANARGYA.V4I2.6442

Dermawan, D. D., & Andartiani, K. (2022). Worksheets Electronic Development of STEAM-Based to Improve Students' Creative Thinking Ability. *Hipotenusa : Journal of Mathematical Society*, *4*(1). https://doi.org/10.18326/HIPOTENUSA.V4I1.7213

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, *42*(3), 255–284. https://doi.org/10.1080/15391523.2010.10782551

Etcuban, J. O., & Pantinople, L. D. (2018). The Effects of Mobile Application in Teaching High School Mathematics. *International Electronic Journal of Mathematics Education*, *13*(3).

https://doi.org/10.12973/IEJME/3906

Fikri, A., & Ramdanil, M. (2021). Penerapan LKPD Berbasis Android Untuk Meningkatkan Kualitas Pembelajaran Sejarah. *ABEC Indonesia*, *9*, 405–416. Retrieved from https://abecindonesia.org/proceeding/index.php/abec/article/view/236

Fina, I. D., Raharjo, R., & Purnama, E. R. (2022). The Development of Electronic-Worksheets (E-Worksheets) Based on Crosswords Games with Sub-Materials of The Excretory System to Improve The Motivation of High School Students. *Berkala Ilmiah Pendidikan Biologi (BioEdu)*, *11*(3), 691–698. https://doi.org/10.26740/BIOEDU.V11N3.P691-698

Fitriana, D., Yusuf, M., & Susanti, E. (2016). PENGEMBANGAN LEMBAR KERJA SISWA MENGGUNAKAN PENDEKATAN SAINTIFIK UNTUK MELIHAT BERPIKIR KRITIS SISWA MATERI PERBANDINGAN. *Jurnal Pendidikan Matematika*, *10*(2). https://doi.org/10.22342/JPM.10.2.3629.23-38

Fitriani, W., Bakri, F., & Sunaryo, S. (2017). PENGEMBANGAN LEMBAR KERJA SISWA (LKS) FISIKA UNTUK MELATIH KEMAMPUAN BERPIKIR TINGKAT TINGGI (HIGH ORDER THINKING SKILL) SISWA SMA. *WaPFi (Wahana Pendidikan Fisika)*, *2*(1). https://doi.org/10.17509/WAPFI.V2I1.4901

Hardayanti, R., Nurhayati, N., & Suhendi, D. (2019). THE DEVELOPMENT OF LEARNER'S WORK SHEET (LKPD) IN UNDERSTANDING THE FOLKLORE TEXT BASED ON SOUTH SUMATERA LOCAL WISDOM. *Proceeding of The International Conference on Literature*, *1*(1), 947–961. https://doi.org/10.24815/.V1I1.14867

Hashim, H. (2018). Application of Technology in the Digital Era Education. *International Journal of Research in Counseling and Education*, *1*(2), 1. https://doi.org/10.24036/002ZA0002

Indiati, I., Supandi, Ariyanto, L., & Kusumaningsih, W. (2021). The effectiveness of the problem-posing method based on android applications in mathematics learning. *İlköğretim Online*, *20*(1). https://doi.org/10.17051/ILKONLINE.2021.01.137

Kharisma, A. D., Syafii, W., & Zulfarina, Z. (2020). Design of Student Worksheets Based on Augmented Reality. *Journal of Educational Sciences*, *4*(1), 176–186. https://doi.org/10.31258/JES.4.1.P.176-186

Maulana, Y., & Sopandi, W. (2022). Needs Analysis of Electronic Student Worksheets to Practice 4C Skills. *Jurnal Basicedu*, *6*(1), 602–611. https://doi.org/10.31004/BASICEDU.V6I1.2044

Nanto, D., Aini, A. N., & Mulhayatiah, D. (2017). Android worksheet application based on discovery learning on students' achievement for vocational high school: Mechanical behavior of materials topics. *AIP Conference Proceedings*, *1848*. https://doi.org/10.1063/1.4983962

Payudi, P., Ertikanto, C., Fadiawati, N., & Suyatna, A. (2017). The development of student worksheet assisted by interactive multimedia of photoelectric effect to build science process skills. *International Journal of Science and Applied Science: Conference Series*, *2*(1), 273. https://doi.org/10.20961/IJSASCS.V2I1.16726

Puspita, V., & Dewi, I. P. (2021). Efektifitas E-LKPD berbasis Pendekatan Investigasi terhadap Kemampuan Berfikir Kritis Siswa Sekolah Dasar. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *5*(1), 86–96. https://doi.org/10.31004/CENDEKIA.V5I1.456

Rohiyatussakinah, I. (2021). Implementation of MBKM and the Relationship of Curriculum Policy based on a Case of EFL Education in Japan. *Journal of English Language Teaching and Literature (JELTL)*, *4*(2), 39–50. https://doi.org/10.47080/JELTL.V4I2.1434

Suci, N. W., Hobri, H., & Murtikusuma, R. P. (2019). PENGEMBANGAN GAME ANDROID BERBANTUAN SOFTWARE GAMESALAD UNTUK SISWA SMP MATERI PERBANDINGAN. *VYGOTSKY*, *1*(2), 65. https://doi.org/10.30736/VJ.V1I2.131

Sumardani, D., Fisika, P., Jakarta, U. N., Saraswati, R. R., Putri, A., Matematika, P., … Muliyati, D. (2020). SYSTEM IMPLEMENTATION OF AUGMENTED REALITY APPLICATION IN STUDENT WORKSHEET. *INFORMATIKA*, *8*(1), 10–18. https://doi.org/10.36987/INFORMATIKA.V8I1.1449

Titin, T., Ganda, R., Panjaitan, P., & Widiyatmoko, A. (2022). Development of Multimedia-Based Worksheets as a Teaching Material on Sub-Material of Invertebrates. *Jurnal Penelitian Dan Pembelajaran IPA*, *8*(1), 91–107. https://doi.org/10.30870/JPPI.V8I1.5139

Widiyatmoko, A., Utaminingsih, S., & Santoso. (2021). Android-based math learning to improve critical thinking. *Journal of Physics: Conference Series*, *1823*(1). https://doi.org/10.1088/1742-6596/1823/1/012091

Wiganingrum, T., Serevina, V., & Budi, A. S. (2019). LEMBAR KERJA ELEKTRONIK PESERTA DIDIK DILENGKAPI VIDEO ANIMASI BERBASIS GUIDED DISCOVERY PADA MATERI GERAK HARMONIS SEDERHANA. *Seminar Nasional Fisika (E-Journal) SNF2019*, SNF2019-PE-307–312. Universitas Negeri Jakarta. https://doi.org/10.21009/03.SNF2019.01.PE.38