Android Application to Measure 21st Century Skills Using Problem Based Laboratory

Salma Rimadani Kusumadewi*, Wanda Aulia Agta & Rian Firdaus

Physics Education, Indonesia University of Education

*salmarimadani@upi.edu**

ABSTRACT

As long Distance Learning is in effect in the midst of the Covid-19 pandemic, the use of technology is very effective for students, it is perceived as a 21st century innovation which is an education system that has a broad reach across space, time, and socioeconomics. In this case, the role of technology in education during the pandemic needs to be maximized. Among them are Information and Communication Technology (ICT) as a tool, educational facilities, and decision support systems. A student must have 21st century skills to succeed in facing the challenges, problems, life, and careers in this 21st century. However, so far, decision support systems in the form of assessments that are applied in almost all schools generally only provide final results and feedback in the form of scores in numbers to students, because they experience difficulties and limitations to measure the 21st century skills that exist in students. This study aims to participate in maximizing the role of technology in education during the current pandemic and to find out the effectiveness of the application of a software application program called Tech-Assess21CS which we have designed and reviewed as educational tools and facilities that can assist the assessment process (Assessment). which is an attempt to obtain data/information from the learning process and outcomes to determine the 21st century skills of students (4C), and how well the performance of students is compared to certain learning objectives/criteria/achievements. The research stage starts from the preparation stage, the manufacturing stage, and the testing stage. This Tech-Assess21CS application has the novelty of assessment applications in general, where in this application there are four categories of questions developed to build competencies that students must have in the 21st century called 4C, namely Communication Skills, Ability to Work Collaboratively, Critical Thinking and Problem Solving, and Creativity. Students will get an evaluation report of learning outcomes equipped with a description of the results of the answer analysis, namely a description of the 21st century skills possessed by students seen from each competency after completing the problem package. So, this Tech-Assess21CS application can be used to measure and find out how 21st century skills are in each individual. The use of this application can reduce school expenditure budgets and streamline time in the process of obtaining and processing student data/information from learning outcomes.

Key Words: *Distance Learning, Software application, Assessment (Assessment)*

1. INTRODUCTION

Education is a process of learning about knowledge and skills that are broad in nature. Education becomes very important for everyone, which aims to educate and develop potential in themselves. During the Covid-19 pandemic, the implementation of learning in Indonesia became less effective due to online. Many obstacles are experienced in the delivery of materials, and the process of assessment or decision-making towards students. In this situation, some schools are very difficult to pay attention to and assess 21st century skills (4C) even schools do not care anymore to pay attention to 21st century skills. Even though these 21st century skills are very important to have in today's life.

Technology in the world of education is a system that is used to support learning so that the desired results are achieved, so that, during the PJJ (Distance Learning) applies in the midst of the Covid-19 pandemic, the use of technology becomes very effective for students, perceived as a 21st century innovation that is an educational system that has wide reach across space, time, and socioeconomics. The role of technology in education in times of pandemics needs to be maximized. Among them are Communication Information Technology (ICT) as a tool, educational facilities, and decision support systems. The growth of

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Proceedings: *International Invention, Innovative & Creative (InIIC) Conference, Series 2/2021*
eISBN: 978-967-18412-7-3 *(Publication Date: 9 November 2021)*   *MNNF Publisher*

information systems is currently very rapid so that it can provide convenience and convenience for users and this can be seen from various activities carried out in a structured and organized manner by an information system that is run in accordance with the circumstances or matters related to the application (Wahyuningsih & Wibawa, 2017).

To achieve educational goals, a student must have 21st century skills: (1.) Critical thinking and problem solving (2.) Creativity (3.) Communication skills, and (4.) Ability to work collaboratively, in order to succeed in facing challenges, problems, lives, and careers in the 21st century. Students need a medium to be able to know and measure their 21st century skills. Understanding this condition, we participated in maximizing the role of technology in education by creating an application called Tech-Assess21CS as an educational facility that can help in the decision-making and assessment process, which is an effort to obtain data / information from learning processes and outcomes to know the skills of the 21st century in students.

2.   LITERATURE REVIEW

2.1 Assessment

Assessment is an integral part of learning because it relates to the competence and way learners learn. Jihad & Haris (Nurhamidah, 2013: 204) suggests that assessment is an activity to obtain data or information that is effective from the learning outcomes   of   learners and provide   feedback.   As a basis for determining the next treatment that can be done by educators. Assessment   emphasizes   learning outcomes,   while   assessment emphasizes learning processes and   outcomes,   in favor of those that are assessed, related to the achievement of curriculum targets,as well   as It aims to develop the potential of the individual   being processed.

2.2 21st Century Skills

The 21st century is known for its time of knowledge. Knowledge is growing and technology is getting more sophisticated. The development of knowledge and technology asks one to have more skills to be able to compete in the 21st century (Ningsih, Winarni and Roetmintoyo, 2019).
21st century skills can be interpreted specifically by Trilling and Fadel (Wulan, Isnaeni and Solihat,2018) as their appearance that has implications for the educational process that does not only focus on in the implementation of learning activities traditionally oriented to the development of cognitive skills, but rather the learning process directed to contemporary issues.

3.   TECHASSESS21 ANDROID APPLICATION CREATION

Procedures in application creation are adapted from the R&D. Research and development method that produces techassess21 products. One of   the stages that can be used in development, namely by adapting the ADDIE development model.   ADDIE development has five mainstages, namely *analysis, design, development, implementation,* and *evaluation* (Aziz & Prasetya, 2018; Tegeh & Kirna,2013).
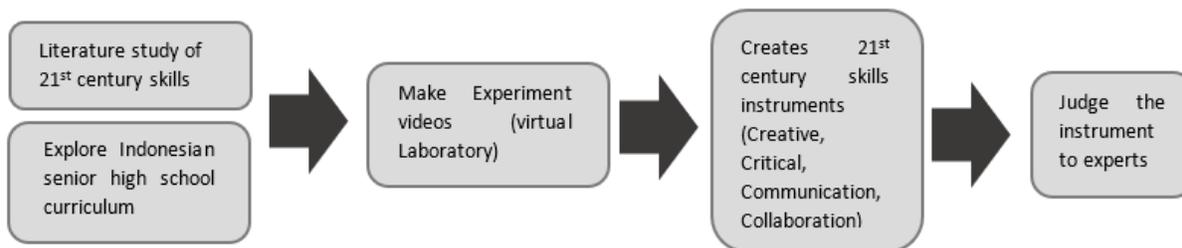

Figure 1. Steps Developing Application

First step we do literature study of century skills and explore indonesiann senior high school curriculum. Second step is developing 21st century skills instruments and its related video in this projects we choose time measurement and physics measurement. Then, we ask three associate professor in physics education two teacher to judge and review our instrument. After all materials are validated by experts, then we can do programming steps.

For programming steps, first stage is need analyze. We use android studio to make teachasses21. The hardware used on OPPO A57 with 4GB RAM. Second stage is plan the design. At this stage, we are design will be displayed on application to easy understand and use by user. The third stage is create an app. Its programming stage with program coding, that can be run using android studio software. The fourth stage is implementation and testing. At this stage will be teste on several smartphone by asking user about the application.

System Design

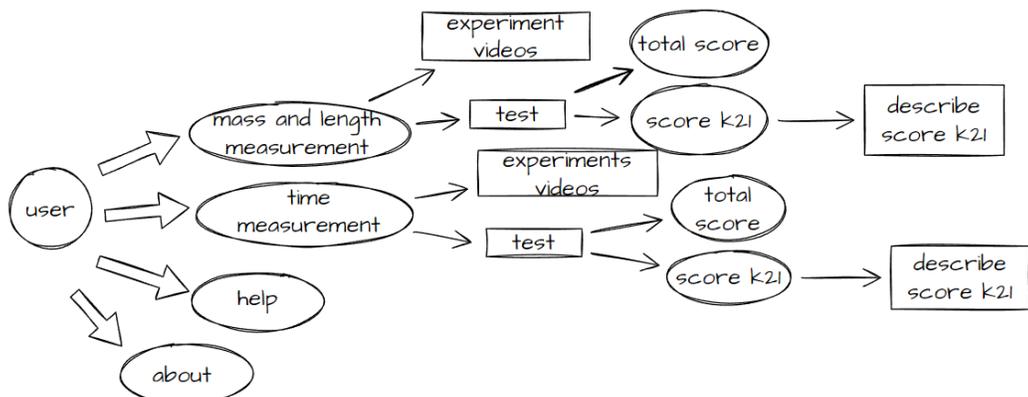Use case diagrams to present the interaction between the actor and the system.

Figure 2. Design use case diagram

4. RESULTS & DISCUSSION

a. The main menu

The main menu test results can be seen in table 1.

Table 1. Main Menu

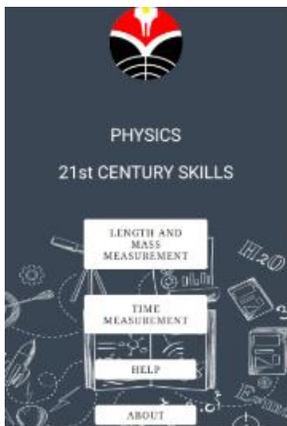| Details and test result	
Input	The user opens the application by pressing the application icon
Expected result	Displays the main menu with several menus, there are : material about length and mass measurement and time measurement, help and about
Test result	Succeed

Figure 3. The Main Menu

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eISBN: 978-967-18412-7-3 *(Publication Date: 9 November 2021)*   *MNNF Publisher*

b.   Length and mass measurement material and time measurement material

The material about length and mass measurement and time measurement results can be seen in table 2.

Table 2. Material about length and mass measurement and time measurement material test

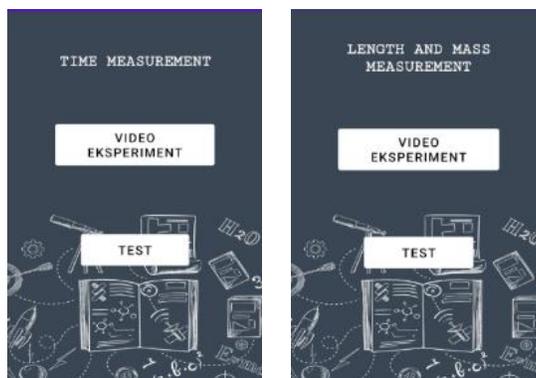| Details and test result	
Input	The user selects the material about length and mass measurement and time measurement
Expected result	Displays videos and test menu
Test result	Succeed

Figure 4. The material about length and mass measurement and time measurement

c.   The question menu

The question menu results can be seen in table 3.

Table 3. Question menu test

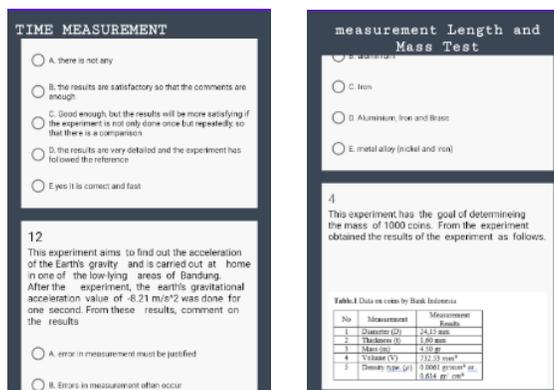| Details and test result	
Input	The user selects the question menu
Expected result	Displays 16 test question regarding 4C Skills, then there is a submit button to display the score results obtained
Test result	Succeed

Figure 5. The material about length and mass measurement and time measurement

d.   The total score menu

The total score results can be seen in table 4.

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Table 4. The total score menu test

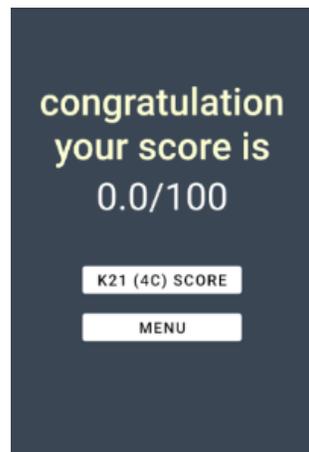| Details and test result	
Input	The user selects the submit button then total score page will appears
Expected result	Displays the overall score, and a menu to the k21 score page
Test result	Succeed

Figure 6. The total score menu

e. Score k21 menu

The score k21 results can be seen in table 5.

Table 5. The score k21 menu test

Details and test result	
Input	The user selects the k21 score buttin on the total score page
Expected result	Displays scores according to indicator of 4C
Test result	Succeed

Figure 7. The score k21 menu

f. Describe k21 score menu

The describe k21 score results can be seen in table 6.

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Table 6. The describe k21 score menu test

Details and test result	
Input	The user selects the describe k21 score button on the k21 score page
Expected result	Displays showing describe of the score k21
Test result	Succeed

Figure 8. The describe k21 score menu

g. Help menu

The help results can be seen in table 7.

Table 7. The help menu test

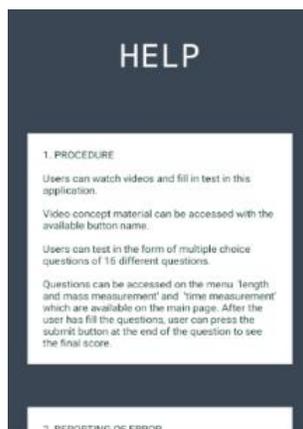| Details and test result	
Input	The user selects help menu on the main page
Expected result	Showing the guide on using this application
Test result	Succeed

Figure 9. The help menu

h. About menu

The about results can be seen in table 8.

Table 8. The about menu test

Details and test result	
Input	The user selects about menu on the main page
Expected result	Showing the information about this application
Test result	Succeed

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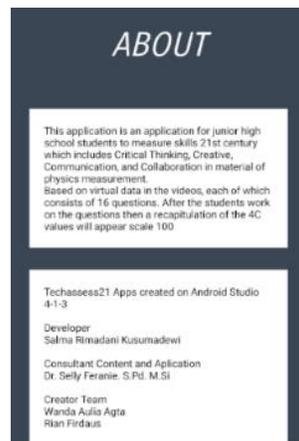*eISBN:* 978-967-18412-7-3 *(Publication Date: 9 November 2021)*   *MNNF Publisher*

Figure 10. The about menu

5. CONCLUSION

Technology has developed so rapidly that it takes teachers who can adapt and character in the world. Not only teachers are adapting, but learners also have to adapt to the development of technology in the present. Therefore, the quality of education must be improved. As we know, schools as educational institutions are required to have the ability to think creatively, critical thinking, communication, and collaboration. With the development of 21st century skills, it is expected that every student has the skills to live in the 21st century with a variety of opportunities and challenges that will be faced in the era of technology and information. This time is experiencing an era of disruption that is undergoing an all-digital change. The benefits of digital technology can be used to measure creative thinking, critical thinking, communication, and collaboration. In this work we present Android app development to measure high school 21st century skills student. We made a virtual science experiment video. Based on the video we extract multiple choice questions to measure creative, critical thinking, communication and collaboration skills. The instruments are then reviewed by science education experts. Then we gathered all the content to develop android apps using android studio. Users can install it on their android-based phone, when opened there will be an option to measure 4C. First they have to watch the video, based on the video they can start filling in 4C questions and then there is a description of the 4C results. Once they are done the results will show a recapitulation of their 4C value. This apk can be an alternative tool sized 21st century st skills for senior high schools for both students and Physics teachers. It's easily a user tool and the results are instantly shown.

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