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MOBILE COMPOSITE APPLICATION SIMULATOR AS EFFICIENT LEARNING MEDIA

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ABSTRACT

The development of Information Communication and Technology (ICT) has affected on various sectors. In the field of education have been used in the development of learning media. It is not cheaper to buy the laboratory equipment's and also the maintenance. Therefore, various laboratory equipment used in learning media with the help of ICT can be developed simulation application. Particularly in the field of mechanical engineering laboratory equipment required a tools to be used on calculations in combining or arranging the chemical properties and physical properties of material objects, thus producing an appropriate composite material. By using android developer can be developed mobile-based applications that act as a simulator in terms of composite calculation composite materials more accurate and efficient. Using this application is improving efficiency in providing laboratory equipment's and maintenance cost.

Keywords: learning, laboratory, ICT, mobile, simulation, mechanical.

1. INTRODUCTION

The evolution of technology that is increasingly developing has given effect to humans to change their lifestyle so that they can better adapt to the existing technological conditions. In this era of globalization, the development of Information Communication and Technology (ICT) has impacted on various sectors, so much that everyone can use ICT to assist their task. Technological developments, especially Information and Communication Technology have benefited from the development of learning media used both in theory and practice learning. Information and Communication Technology can be used as learning aids, and can even replace the role of the teacher in learning.

In line with Industry 4.0, at present the development of ICT makes producers compete to produce products that are mobile so that they are more flexible and can be carried everywhere. Thus slowly the use of Personal Computers has slowly begun to decline. Urban communities are increasingly busy and have high mobility so they certainly prefer mobile technology. The mobile era also presents tablets, as one of the sophisticated technology devices and has many uses. Smaller tablet sizes than laptops also cause some people to prefer to use tablets. In addition to laptops and tablets, there are also technologies that have progressed very rapidly now, namely gadgets or smartphones. Today, with a small size, smartphones are increasingly sophisticated and have various applications that make it easier for humans to carry out various communication activities. Using of learning media in the teaching and learning process needs to be planned and systematically planned so that the learning media are effective and more efficient for use in the teaching and learning process.

Every university in carrying out its activities certainly requires laboratory facilities and infrastructure. Thus a substantial cost is needed in the procurement of equipment and maintenance. ICT is used to develop learning media for various laboratory equipment. In a teaching and learning process, two very important elements are teaching methods and teaching media. The media developer must provide the learning desired by the learner. So that when a person finishes a program he will feel he has learned something. With the use of ICT, various computer simulation applications can be developed from laboratory equipment used. With Computer Programming can be developed various laboratory simulation applications. Efficiency can be measured from output compared to the required input. By using this application simulator each student can use the application on their tablets and or smartphones. Thus, it is no longer necessary to purchase laboratory equipment. Likewise, it is not necessary to maintain laboratory equipments which of course also require considerable costs.

2. COMPOSITE

The composite is a material formed from the combination of two or more materials to produce a composite material that has mechanical properties and characteristics different from the material forming. Composites have better mechanical properties than metals, type stiffness (Young/density modulus) and strength of species higher than metal. Some composite lamina can be stacked with different fiber orientation directions, and this lamina joint is referred to as laminate. The composite consists of two main parts:

a) The matrix serves for adhesive or binder and protective filler from external damage. Matrices, generally more ductile but have lower strength and rigidity. Matrices commonly used: resin, carbon, glass, kevlar, etc.

b) Filler serves as an amplifier of the matrix. Reinforcement (reinforcement), which has fewer ductile properties but more rigid and stronger, in this study the composite amplifier used is from natural powder. Filler commonly used: fiber, powder, etc.

2.1 Composite types

Broadly speaking there are three types of composites based on the amplifier they use, namely:

A. Particle composite materials

In a composite structure, the composite material of particles composed of particles is called particulate composite, according to the definition of the particles being shaped like a spherical, cubic, tetragonal or even irregularly shaped randomly, but on average of the same dimension. Particle composite materials are generally used as filler and reinforcement ceramic matrix composites. Particular composite materials are generally weaker than fiber composite materials. The particulate composite material has advantages, such as resistance to wear, not young cracking and having a fast matrix with the matrices. The composite particle material as shown in Figure-1.

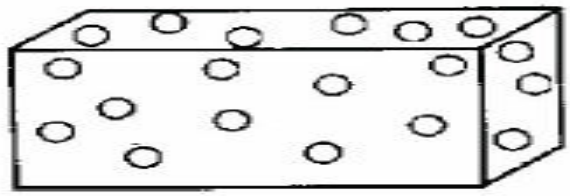

Figure-1. Particle composite materials.

B. Laminate composite material

The laminate composite as shown in Figure-2 is a composite consisting of two or more layers and a reinforcing material incorporated into one and each layer having its own characteristic properties, for example poly wood, laminated glass which is often used as a building material and its fittings.

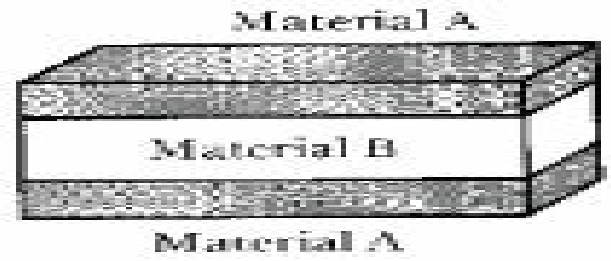

Figure-2. Laminate composite materials.

C.Fiber composite material

The main ingredient of composites is fiber that has many advantages; therefore the fiber composite material is the most widely used. The fiber composite material consists of fibers bound by an interconnected matrix. This fiber composite material consists of two kinds, namely fiber length (continuous fiber) and short fiber (short fiber and whisker). The use of fiber composite materials is highly efficient in accepting loads and forces. Therefore, the fiber composite material is very strong and rigid when loaded in the direction of fiber, otherwise very weak when burdened in the perpendicular direction of the fiber. In addition, fiber also saves the use of resin. The fiber composite material as shown in Figure-3.

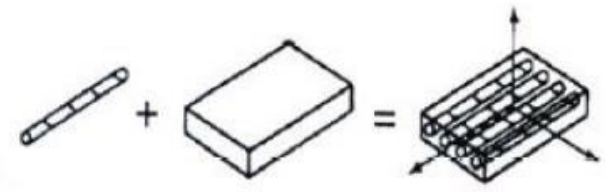

Figure-3. Fiber composite materials.

2.2 Tensile test

The tensile test is included in the most basic material testing. The testing is very simple and already has standardization around the world (American ASTM E8 and Japan JIS 2241). By conducting a tensile test of a material, it will be known how the material reacts to the pull energy and the extent to which the material increases in length. The experimental tool for this tensile test should have a strong grip and high stiffness. Draw a tensile testing machine as shown in Figure-4.

Figure-4. Tensile test machine.

If the tensile force continues to be applied to a material until it breaks out, a full pull profile of the curve as depicted in Figure-5. This curve shows the relationship between the pulling force and the length change. This profile is indispensable in designs that use the material.

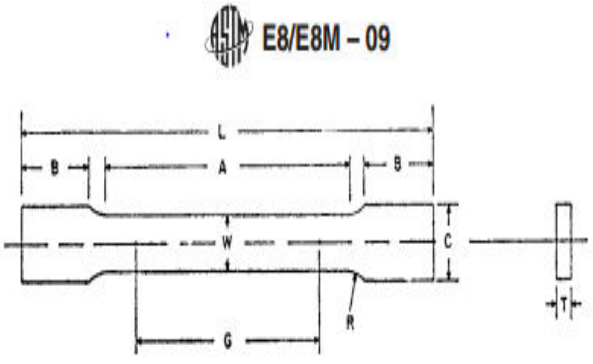

Figure-5. Curved relationship curve and long change.

The most important thing in the tensile test is the maximum capability of the material in holding the load. This capability is generally called "Ultimate Tensile Strength" abbreviated as UTS or Maximum Pull Voltage.

3. MEDIA INTERFACE OVERVIEW

Understanding learning media are all teaching tools that are used to help convey the subject matter in the teaching and learning process so as to facilitate the achievement of the objectives of the learning objectives that have been formulated. Association for Educational Communications and Technology. The Association for Educational Communications and Technology (AECT) provides a definition that is everything that people use to channel messages and can stimulate students to learn more. Learning media used in learning activities can influence the effectiveness of learning. In the beginning, the learning media only functioned as a teacher's tool to teach which was used as a visual aid. Around the middle of the 20th century visual utilization efforts were complemented by the use of audio equipment, so audio-visual aids were born. In line with the development of ICT, especially in the field of education, currently the use of assistive devices or learning media is becoming increasingly widespread and interactive, such as the existence of computers and the internet.

Learning media have several functions, including: (1) Learning media can overcome the limitations of experience possessed by students. The experience of each student varies, depending on the factors that determine the wealth of a child's experience, such as the availability of books, opportunities for travel, and so on. Learning media can overcome these differences. If students are not likely to be brought to the object directly studied, then the object is brought to the students. The object in question can be in the form of real, miniature, models, and forms of images that can be presented in an audio-visual and audible manner; (2) Learning media can exceed the limits of classrooms. Many things that cannot be experienced directly in the classroom by students about an object, which is caused, because: (a) the object is too large; (b) the object is too small; (c) objects that move too slowly; (d) object that move too fast; (e) objects that are too complex; (f) object that sound too smooth; (f) objects contain dangerous and high risk. Through the use of appropriate media, all objects can be presented to students; (3) Learning media allow direct interaction between students and their environment; (4) Media produces uniformity of observation; (5) The media can instill basic concepts that are true, concrete, and realistic; (6) The media evokes new desires and interests; (7) The media evokes motivation and stimulates children to learn; (8) The media provides an integral / comprehensive experience from the concrete to the abstract. In line with the development of ICT so that the mindset of teachers must be changed to a constructive. The program developer must provide the learning desired by the learner. So that when a person finishes a program he will feel he has learned something.

The user interface becomes the most important thing of every application creation. The interface can be said as a bridge that connects between the user and the application. If the built interface does not match the users who will be using the app, then the user will feel uninterested in using the app. For that matter, required an interface that suits the users, so that application, that have been built, can be perceived benefits. Figure-8 is an overview of the developed application interface:

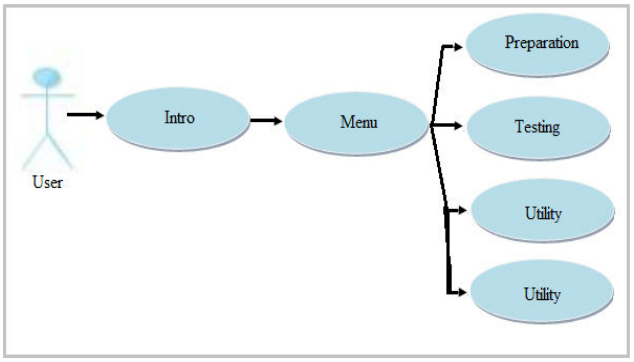

Figure-6. Use case interface for user menu.

Figure-6 illustrates the design framework of the main menu of the developed application. The main menu was developed and implemented on android with a view as shown in Figure-7.

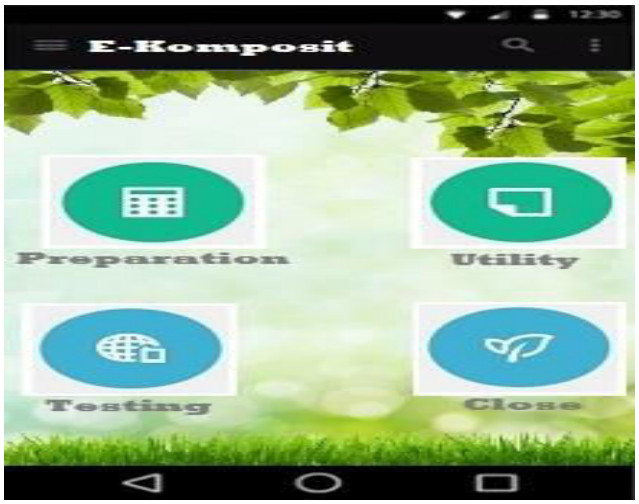

Figure-7. Application menu on android.

Display menu interface in Figure-7 consists of four menus are: preparation, utility, testing and close. To do a tensile test on an application by pressing the preparation menu button. To do a tensile test on an application by pressing the preparation menu button. Then, inputted material data and conditions are done as in Figure-8. The menu interface of preparation in Figure-8 is an executable test model. There are three choices of test menu that is tensile test, compression test and bending test. In addition to this menu there is also a menu for the type of specimen to be tested, the choice is round, plate or hollow. While for other input in the form of specimen length tested and specimen diameter. In the last option is the specimen test material that is alloy steel, aluminum, dialuminium, copper, brass/bronze, gray castiron, cast steel, stainless steel, Zinc Alloy.

Figure-8. Display of preparation menu.

The tensile test simulation process is shown in Figure-9.

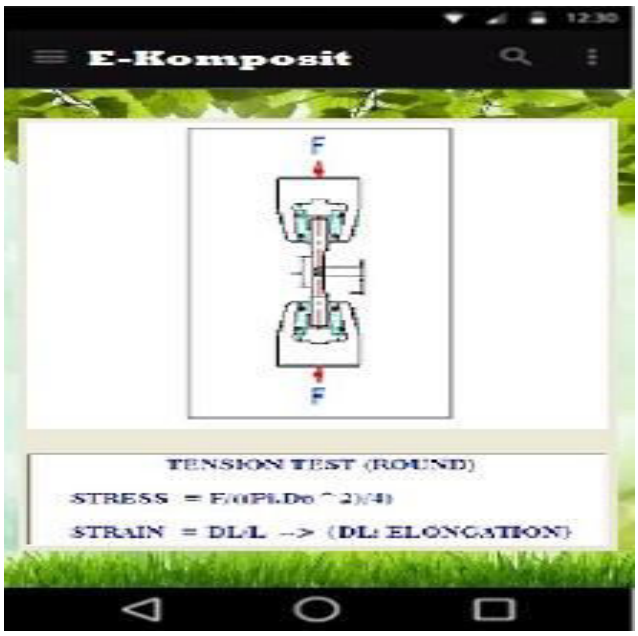

Figure-9. Display simulation pull test.

The most important thing in the tensile test is the maximum capability of the material in holding the load. This capability is generally called "Ultimate Tensile Strength" abbreviated with UTS or Maximum Pull Voltage. Tensile test specimen images complying with ASTM E8-E8M-09 standard is shown in Figure-10.

Dimensions			
	Standard Specimens		Subsize Specimen
	Plate-Type, 40 mm [1.500 in.] Wide	Sheet-Type, 12.5 mm [0.500 in.] Wide	6 mm [0.250 in.] Wide
	mm [in.]	mm [in.]	mm [in.]
G—Gage length (Note 1 and Note 2)	200.0 ± 0.2 [8.00 ± 0.01]	50.0 ± 0.1 [2.000 ± 0.005]	25.0 ± 0.1 [1.000 ± 0.003]
W—Width (Note 3 and Note 4)	40.0 ± 2.0 [1.500 ± 0.125, -0.250]	12.5 ± 0.2 [0.500 ± 0.010]	6.0 ± 0.1 [0.250 ± 0.005]
T—Thickness (Note 5)		thickness of material	
R—Radius of fillet, min (Note 6)	25 [1]	12.5 [0.500]	6 [0.250]
L—Overall length, min (Note 2, Note 7, and Note 8)	450 [18]	200 [8]	100 [4]
A—Length of reduced section, min	225 [9]	57 [2.25]	32 [1.25]
B—Length of grip section, min (Note 9)	75 [3]	50 [2]	30 [1.25]
C—Width of grip section, approximate (Note 4 and Note 9)	50 [2]	20 [0.750]	10 [0.375]

Figure-10. Sample the standard tensile test.

4. CONCLUSIONS

Learning media are needed to stimulate interest in learning. Efficiency can be measured from output compared to the required input. By using application simulator that functions to simulate the tensile machine so that it is no longer necessary to add new purchase laboratory equipment and also it is not necessary to maintain laboratory equipment's. This condition will reduce all costs for laboratory. Even though this simulator provides basic function each student can use the application on their tablets and or smart phones.

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