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Development of Application Based on Metal Casting: A Case Study in a Malaysian Public University

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Abstract: The aim of this study is to develop an android-based learning application for the topic of Metal Casting based on the ADDIE theory and confirmed by experts, based on previously identified problems related to the need for the use of technology in learning versus conventional learning. Data collection will be carried out through the method of interview with respondents. The method of conducting an interview is an in-depth interview. A total of three respondents have been carefully selected from among those who have knowledge and experience of 10 years and over as well as the connection of the respondents to the VDT3023 Manufacturing Technology course and also in the multimedia field. The information obtained from the results of the interview was analyzed using content analysis methods. The design of the study used is to refer to the ADDIE model, namely Analysis, Design, Development and Implementation, taking into account aspects such as the content and also the elements of the interface of the mobile application studied on the basis of the ADDIE theory. The results of the survey show that all respondents agree that the contents and the interface elements of this mobile application have achieved the objectives and objectives set at the beginning of this application to be developed. The development of this application can add value to the metal casting topic. Thus, this study can be beneficial in the world of education especially in the field of technology today.

Keywords: Teaching Aids, Metal Casting, Metal Casting Applications, Manufacturing Technology

1. Introduction

Nowadays, information and communication technology (ICT) has developed along with the passage of time and it has dominated the world extensively. Almost every moment people use this technology and it is with technology that allows us to master and control almost everything at the tip of our fingers (Holtgrewe, 2014). The use of communication technology tools such as mobile phones, computers and tablets is something that is commonly used today, especially among the youth. Most users of communication technology today are pioneered by the youth because they are the most sensitive group of society to the latest trend changes. In today's situation, the role of ICT is seen as very important in improving the quality of life of the community (Kamarudin et al., 2019). The borderless world that exists today is an impact of the development of new media in the relationship in cyberspace that cannot be avoided due to the freedom of communication technology competition. Lee et al. (2016) stated that the rapidly developing explosion of communication technology has provided a wide opportunity in improving the quality of life. Quality of life is a level of well-being and comfort of life obtained by a person (Nor & Ilias, 2012). It cannot be measured because changes occur according to the environmental situation to be evaluated. In improving the changes in human life, the guidelines for the quality of life must be arranged in an orderly manner (Bunyau & Wahab, 2013).

Manufacturing technology is a compulsory course taken by students of the Technical and Vocational Faculty at Sultan Idris Education University. Therefore, students need to be proficient in the knowledge and skills in designing, processing, operating and managing the systems and equipment used in the manufacturing of manufacturing technology. It consists of tasks that include context in line with the latest industry developments. Students will study basic and advanced design drawings (CAD/CAM) related to Engineering using conventional and CNC machines involving Milling

Machines, Lathe Machines and Rolling Machines, Electrical Discharge Machining (EDM) Die Sinking and Wire Cut. Students not only need to be skilled in using machine tools but also need to be skilled in the use of technology (Mustapha et al., 2020). Nowadays, education in technical and vocational fields is very necessary because Malaysia needs skilled workers in technical fields. According to Mustapha et al. (2014) stated that society today places high hopes and trust in Vocational Technical Education (VET) institutions to produce knowledgeable individuals and master technology and various generic skills, as well as skills to compete at the global level. The need for students to be skilled in the field of manufacturing technology is very important to ensure that Malaysia can compete with developed countries.

Nevertheless, the issue of students' weaknesses, especially in knowledge and skills in designing, processing, operating and managing the systems and equipment used in the manufacturing of technology, becomes the main focal point that needs to be emphasized and given serious attention. Therefore, there are various delivery and learning methods and strategies that have been developed by educators to ensure that students can follow, understand and master each learning content well. It is well known that students today are more interested in interactive learning. Interactive learning can attract students' interest and attention and arouse curiosity in students (Jenal, 2017). With the change of the current era of technology that many use various tools such as application development as well as android applications that can be downloaded into smartphones. According to Ghavifekr & Rosdy (2015), domestic and foreign studies show that the use of ICT such as multimedia teaching software, the web and others can improve student achievement in academics. According to studies, students spend an average of 16 hours a day using smartphones (Mansour, 2016). Therefore, the method of teaching and learning with the help of android applications is very suitable to be used to attract students' interest in manufacturing technology.

In recent times, various measures have been taken to encourage the widespread use of technology. Along with the development of technology in education, the use of M-learning has become a worldwide concern to be used as a learning medium. Kechil and Awang (2021) explained that mobile learning (M-learning) or mobile learning is a new concept in the learning process that emphasizes the ability to facilitate the learning process without depending too much on the situation or environment of the learning process that takes place. Learning modes that use technology or mobile devices are intended to facilitate and support mobile learning (Nikolopoulou, 2018). M-learning is flexible and allows students to access education anywhere and anytime (Murat et al., 2020). This is because the mobile device is more flexible without limitations of place and time.

The readiness of educators and students in Malaysia towards the use and mastery of M-learning is very important. This is said to be so because they are the main users who ensure that the learning process takes place. Nowadays, the education system in Malaysia has experienced changes from various aspects such as the use, approach, strategy, method, technique, tool, and resources in the learning process (Saidin & Husnin, 2021). Along with the educational needs of the 21st century, the paradigm shift of Manufacturing Technology Lecturers from teaching methods using mobile applications to change the perspective of students towards Manufacturing Technology courses to be more effective. Therefore, the application that will be developed is the lesson of the 7th week which is the Topic of Metal Casting. So, this study was done to study the learning and facilitation problem in the Manufacturing Technology course for the topic of Metal Casting, especially for FTV students and to develop an android-based learning application for the topic of Metal Casting based on ADDIE theory. The research question of this research are:

1) How to develop metal casting applications for students in Malaysian public universities?
2) How does the development of an application based on metal casting enhance the learning experience and technical skills of students in a Malaysian public university?

The hypotheses of this research are:

H1: The development of an application based on metal casting significantly improves students' understanding of the metal casting process.

Ho: The development of an application based on metal casting does not significantly improve students' understanding of the metal casting process.

2. Literature Review

Pedagogy is the study of teaching, particularly formal education. In other words, pedagogy is an art as well as a science related to the methods and techniques of teaching in the classroom. This pedagogical practice is an initiative used by instructors when teaching in the classroom with the help of the latest technology tools to facilitate information delivery sessions to students. Even so, this pedagogical practice can change according to a person's situation and environment at that time. This is because the pedagogy practices in schools and universities have their own differences so that students need to adapt pedagogy in universities to help facilitate their teaching process. According to Wallace (2015), pedagogy is defined as teaching principles and methods. In the university world, the teaching methods applied to students are different because students at this level are already categorized as adult students and lecturers use different approaches in teaching. This is because adult learning is better known as andragogy. Lecturers who have a pedagogical practice orientation will find it difficult to help students because there are differences in pedagogical practices in schools and in higher institutions, so lecturers need to pay attention to teaching aids and the issue of school to university transition because inappropriate pedagogical practices will disrupt the transition process students to adapt themselves to being in

university. This is because the transition process of students is a process for them to adapt.

Conventional teaching has become the norm for lecturers, especially for lecturers who have been teaching at universities for a long time. The old teaching method, which is the conventional teaching method or better known as the 'chalk and talk' method, is still in demand and comfortable to use by veteran lecturers in the teaching and learning process in the lecture room. The use of conventional learning in the lecture room will reduce students' interest in a subject and reinforce the interpretation of students who say that a subject is boring. According to Noh et al. (2017) the conventional approach commonly practiced by educators today has been found to have weaknesses that have been identified such as one-way information delivery, content delivery is solely based on educator's notes and books, educators usually talk continuously without knowing level of acceptance and understanding, learning is based on memorization rather than understanding. This can be seen when many students lose interest in learning, especially students who are generation Z and Alpha.

Changes in the education system as a result of the Covid-19 pandemic have caused educators to change the new teaching and learning process pattern, which is to use online learning. Although the Covid-19 pandemic is subsiding in 2023, online teaching is still relevant. One of the reasons why this teaching is still relevant is because it is more creative, interactive and interesting for students. Although at first this online learning is quite difficult for students, but most of the lecturers and students have mastered this technique and online learning. Not only that, this learning can help lecturers and students and students can manage their schedules more systematically because they can divide time for studying and other activities just by using the application. According to Mahlan and Hamat (2020), applications that are frequently used are applications such as WhatsApp, Telegram, Google Meet, Google Classroom, Microsoft Teams and Zoom.

Mobile Learning or mobile technology is a facility that has been created like a mobile cellular phone. This technology can be obtained through the use of today's modern technology such as mobile phones and computers. The development of this technology helps students to acquire knowledge anywhere. The use of M-Learning has been widely used in developing countries such as Europe. According to Hinostroza et al. (2018), mobile learning as a long-term strategy in Spain. This is because M-Learning has become a medium that is very important to foreign countries either from primary school level to university because it has various benefits. Among the M-Learning used are based on software applications that can be used to perform specific tasks and can be downloaded using a smartphone. The use of mobile applications can make a person more productive when they use, create or interact with information through mobile devices because these devices are almost involved in the daily activities of humans (Govindasamy et al., 2019). There are several previous studies, Table 1 is the use of applications used in the study of the use of M-Learning which comes from four researchers.

Table 1. Previous Studies on the Use Of M-Learning Applications

Researcher	Country	Application	Development Factors
Dekhane and Xu (2012)	US	GameSalad	To increase engagement and maintain student engagement in the Digital Media general education IT course
Abildinova et al. (Abildinova et al., 2016)	Kazakhstan	Educational Process Remote	Studying the effectiveness of mobile applications in the field of education
Jayatilleke et al. (2019)	Sri Lanka	OUSL MLearn	Innovative mobile applications using design-based design
Zhou and Zhang (2018)	China	Web Application	To provide knowledge about the system in the curriculum that is students can discuss, learn and collaborate with each other to realize deep integration and appreciation based on knowledge

3. Methodology

Researchers conducted a study at a public university in Perak and three experts were selected as respondents for the validity of the Metal Casting Technology application in helping students for the VDT2023 Manufacturing Technology course better understand the casting process found in metal casting. Based on Table 2, the background of the respondents who have been selected and have different experiences. The study uses a qualitative approach through a structured interview method and the researcher prepares an interview protocol. This interview is to obtain information from experts face-to-face or communicate orally. Barrett and Twycross (2018) states that an interview is a detailed communication conducted by the interviewer according to the established lines. All communication dialogues that occur will be recorded to facilitate researchers to get clearer information about the usability of this Metal Casting application. Interviews conducted with all respondents were conducted face-to-face. All conversations with respondents will be recorded using mobile phones and the time for the interview will be 15 minutes. All the data obtained from the interview session will be typed and coded to facilitate the researcher to analyze the information from the interview results to obtain its validity. The method of analysis used for this interview is content analysis.

Table 2. Profile of Respondents

Respondent	Gender (M/F)	Background/Position and Duties	Work experience
Respondent 1	Male	Manufacturing Technology Course Lecturer	15 Years
Respondent 2	Male	Educational Technology Course Lecturer	12 Years
Respondent 3	Male	Food Technology Course Lecturer	19 Years

This study was conducted to develop a mobile application for the topic of metal casting for the course VDT3023 Manufacturing Technology, which is Metal Casting Application. The development and design of the application prototype in this study is based on several phases found in ADDIE instructional design. This ADDIE model is used by all researchers who develop software and applications related to education (Stapa & Mohammad, 2019; Pratama et al., 2021). This is because the ADDIE Model stands for Analysis, Design, Development, Implementation and Evaluation. Based on the ADDIE Model, there are many researchers using this model to develop applications. Table 3 shows some studies using the ADDIE Model.

Table 3. Past Studies that Use the ADDIE Model

Researcher	Title	Application
Ahmad et al. (2020)	Development and Design of BRESWORK_APPS: A Breastfeeding Mobile Application Module for Working Women	BRESWROK_APPS
Arief et al. (2018)	Development of a Web-based Tik Learning Application Using the ADDIE Model for SMK students	ICT Learning Web-based Application
Miswan & Mohd Adnan (2015)	Ipad Application Development for Children's Education	LiLIN application

This research is conducted using the interview method and the research is qualitative in nature. The type of interview that will be conducted is a structured interview that is by asking questions related to the content and also the interface design of the study being conducted. The qualitative method was chosen as the research method for the study to be carried out by using the interview method to obtain more accurate and extensive data. Therefore, the research instrument used by the researcher in this study is to create interview questions to be asked to the three selected respondents. The intended method is to obtain information about the functionality of android-based mobile device applications for Metal Casting Topics in terms of content reliability and also interface design for students and lecturers of VDT3023 Manufacturing Technology easily and flexibly.

4. Results

4.1 RQ1: How to develop metal casting applications for students in Malaysian public universities?

4.1.1 Analysis phase

The analysis phase is the first phase of the ADDIE model. Therefore, the production of this android-based application was developed to overcome the problems faced by students who are less interested in learning using conventional teaching methods in addition to being able to integrate the use of ICT in learning and facilitation. The target user is suitable for all students taking the VDT3023 Manufacturing Technology course. This mobile device application is titled "Metal Casting", it is suitable for all levels of students, but this application is created to focus on students who take the course VDT3023 Metal Casting Technology. This learning standard is also suitable based on the proforma for the Manufacturing Technology course. The android-based application produced through this software uses the Website 2 APK Builder Pro software.

4.1.2 Design phase

This stage is carried out after the needs analysis process is completed. Through this design phase, Canva software is used to build a story board or "Story Board" to show the arrangement of graphics in the form of illustrations or images that are presented for pre-screening purposes for the developers of this application. With the existence of a storyboard which is a visual arrangement allows software programmers for Software Development for this application to run smoothly and in an orderly manner. The earliest step in the development process of this application is to start a search for images related to the casting of metal materials through a "Google" search on websites known as 'Pixabay', 'Pexels' and 'Unsplash' to obtain interesting open-source images. Next, the developer will create a storyboard by using Canva, the developer will include a hyperlink for each storyboard to show the interface relationship for each storyboard in the development of the

final application later. There are three aspects of design involved in the development of this mobile application, among them.

4.1.3 Module design

The main design involved in the development of this android-based application is the module design. Fig. 1 shows the design of the modules involved in the development process of the Metal Casting Application. The arrow has shown the module transition navigation along with the menu for each item found in the developed mobile application.

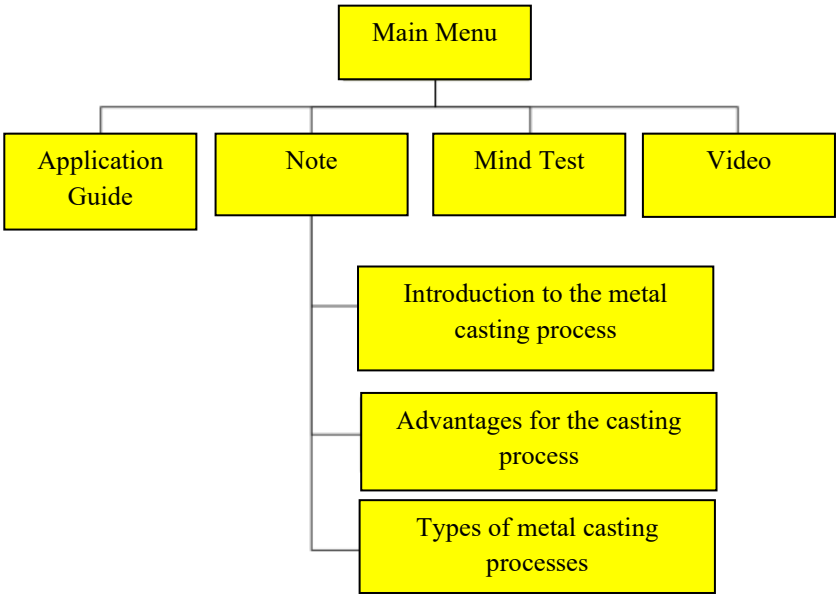


Fig. 1: Design of Metal Material Casting Application Module

This Metal Casting Application consists of four main items namely Application Guide, Notes, Mind Test and Video. This item will give different delivery. For the first item which is the Application Guide that provides information on how to use the application. In addition, the notes section will provide explanations on three subtopics, namely the introduction to the metal casting process, the advantages of the casting process and the types of casting processes. In the note, there are also picture elements that can provide an understanding that improves the user's knowledge. Next, the Mind Test item. This mind test is based on the content found in the notes. Students are required to answer the question as a reinforcement activity after learning using this application. Finally, video items to provide further understanding to users. Through the video as well, users can fully understand the casting process produced globally. The four main sections contain different content. Table 4 shows the four main sections and a summary of information for each section.

Table 4. Explanation of the Parts of The Application

Section	Summary Information
Application Guide	This section explains about the application guide which is the information found in the metal casting mobile application
Note	The section consists of three subtopics which are an introduction to the casting process, advantages for the casting process and types of casting processes
Mind Test	The mental test part can be answered after all the notes have been read in this application to test the understanding of the casting of metal materials
Video	This section is a video to further improve the user's understanding of the metal casting process

4.1.4 Multimedia element design

Multimedia design is a technique in integrating various media such as text, graphics, audio, video and others. The use and addition of multimedia elements in this application is intended to produce effective information delivery through the use of interesting and interactive computer technology. There are five multimedia elements included in the Metal Casting mobile casting application namely topography, audio and graphics. The design of the typographical multimedia elements used by the developers in this mobile application involves the selection of typefaces and the type of writing colors used. Because this application was developed for learning purposes, the text design, which is the type of font chosen, should be clear and bright for the presentation of information that is clear and easy to understand by the target user. The chosen font types are "Antonio" and "Montserrat". Both of these writings are Sans-Serif Humanist typefaces. Sans-Serif fonts were

chosen because they are suitable for children's learning. Fig. 2 shows the difference between Serif and Sans-serif fonts and Fig. 3 shows writing in metal casting applications.

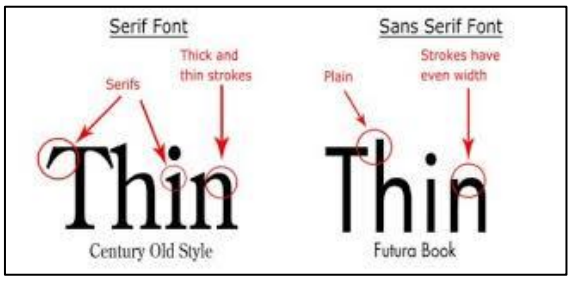


Fig. 2: Comparison of Serif and Sans Serif fonts



Fig. 3: Writing Used in Metal Casting Applications

The design of the graphic multimedia elements found in the Metal Casting application is the design of the graphic multimedia element found in the Metal Casting mobile application is the graphic that produces images, icons, buttons between myka and so on. The selected background color of the application is “Merigold” and black. The developer chooses the color as a color that is compatible with the use of the application as a base in the casting of metal materials. As for the color of the writing used, it is a color that is opposite to the color of the background used. This is to make it easier for users of the Metal Casting mobile application to see and read the writing on the application clearly and well. Fig. 4 shows the theme colors used in the application.



Fig. 4: Themes used in Metal Casting Applications

The use of icons in the Metal Casting application is no less important. An icon is a symbol or image that is used to symbolize the function of the symbol or image itself. The main purpose of the icons loaded into the Metal Casting application is to make it easier to use the application, to access information faster and easier, with the help of the icons found in the application. Icons serve to assist in the navigation process. Each icon will include hypermedia and hypertext to connect with each other in this easy-to-use application. Among the parts that use icons is the "Home" button, replaced with a home icon and so on.

4.1.5 Interface design

Fig. 4 shows the interface design found in E-learning such as electronic learning, digital learning, online learning, web learning and so on. According to Hazwani and Dalbir (2016) stated that interface design is the core and integrated component of the entire e-learning system. This is very important because the increase in student involvement in learning is the best design and form of e-learning interface that does not meet the needs of students causes them not to participate in e-learning even if it can help in their studies.

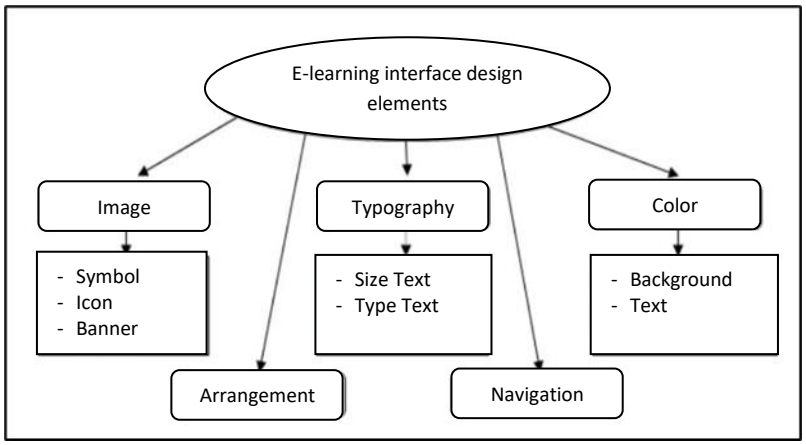


Fig. 5: Elements of e-learning Interface Design

In the interface design, the design of multimedia elements is also included as shown in Fig. 5. Among them is the use of color and also typography which has already been discussed in the multimedia design section. Meanwhile, the layout is designed neatly and organized, the navigation is also planned more carefully so that the elements can work smoothly to ensure maximum use can be benefited by users. Application interface design based on the storyboard that has been prepared to launch the Metal Casting application development process (Fig. 6).



(a)



(b)



(c)



(d)



(e)

Fig. 6: (A) Metal Casting Interface Display, (B) Metal Casting Homepage Interface Display, (C) Note Interface Display, (D) Question Interface Display And (E) Video Interface Display

4.1.6 Development phase

In this Development phase, all the preliminary planning such as storyboards, module division and interface design that were dispersed in the design phase will be implemented. Nevertheless, the planning that was carried out in the previous phases will also be changed according to the needs of the software used. The Metal Casting application was developed using Website 2 APK Builder Pro.

4.1.7 Implementation phase

The implementation phase aims to give students the opportunity to learn to meet the learning goals that have been determined in the previous phase, which is the analysis phase. For this phase is a phase of implementing ideas. The mobile application that has been completed is implemented in the Website 2 APK Builder Pro software, converted into an Android Application Package (APK) file format on an Android-based system, and then inserted into a mobile smartphone. This phase aims to combine all these elements to be loaded into the Clothing Selection application so that its functionality can be tested smoothly without any problems. This implementation phase is very important because it is decisive to ensure that this mobile application is developed to achieve the objectives of this project by identifying suitability, feasibility and reasonableness before it is tried by the targeted group. In this phase it also involves the views and opinions given by experts in terms of the functionality and suitability of the application for the target user.
Evaluation Phase

The assessment phase actually occurs continuously in each previous phase or is called formative assessment. However, there is a final (summative) evaluation aimed at obtaining comments, criticism and feedback from the user group. The feedback received can be used to improve the quality of the Metal Casting application and further satisfy the user's taste. The ADDIE model places great emphasis on improvement including planning, review and revision. At each phase in the ADDIE model provides a checkpoint that allows experts and users to evaluate the progress of the Metal Casting application development. Therefore, the researcher will ask experts to make an assessment to ensure the application meets the development objectives and make improvements. After making improvements, the researcher will re-validate from experts to validate the Metal Casting mobile application.

4.2 RQ 2: How does the development of an application based on metal casting enhance the learning experience and technical skills of students in a Malaysian public university?

4.2.1 Contents of metal material casting application

In general, from the results of the research, it was found that all the respondents agreed that this Application of Metal Casting complies with the proforma for the VDT3023 Manufacturing Technology course. This application conforms to the proforma because each content needs to be researched first using a storyboard. The following will be explained in relation to applications that conform to the proforma, which are as follows: a) the use of storyboards in accordance with the proforma; b) appropriate proforma according to age; and c) pro forma information. In terms of the sentences used in the Metal Casting Application, it is very appropriate because it is easy to understand because most of the sentences used are simple. This is because simple sentences are easy for students to understand.

> *Simple and clear because of the simple sentence only. Only if you can increase the number of infographics. For example, add flowcharts, various charts or any notes that will definitely translate into infographics (R2).*

> *The sentence is clear, it's easy to understand, you write clearly. But for me the current trend, especially cartoonists, they don't like to read a lot. So, I think to give this application interesting, it is necessary to break the sentence into several parts (R3).*

In terms of the description in the application is also one to ensure that every description given in the application is clear and not difficult to understand. A good description, able to enable users to understand the content that is to be conveyed to them.

> *Clear. Also add infographics. More pictures and related videos. For each pour. Show the video and make sure there is a voice of your own. Because if we just watch the video we can forget but if there is a video with voice we listen and we will remember. The description of the video you showed is very appropriate (R2).*

In terms of the question that is used as a mind test on the content of the Application of Metal Casting, it is necessary to carefully adapt it to the content of the learner. This is to ensure that the activities carried out as a mind test do not run away from the learning topics learned from the learning topics learned from the application.

> *The question should be based on subtopics. If you want to measure, you have taught three subtopics, you have to measure all three. Kalua sati subtopic, just like mixing it up? Why not make five questions for the subtopic?*

Questions for structured questions like near the exam. Make a definition question, what are the elements and the last question you can test them, your question also does not run away from the topic and is very appropriate (R1).

4.2.2 Metal material casting mobile App design elements

Findings through interviews found that image elements such as pictures, symbols and icons included are attractive because the use of these elements can attract users to use the Metal Casting application.

Interesting. There's just no originality. Because you make one thing, so when this application is patented later, if there is something you need to declare later. If you don't want to declare, you have to enter your own picture in this application. If possible, put originality like the video you made into this application (R1).

In terms of typographic elements, the size of the text is very important to emphasize because users are very concerned about the size when reading in the application.

The text size is perfect and there is no problem. The type of text you use makes it easier for users to read (R2).

In addition, the findings of the interview also in terms of the layout and navigation elements of mobile content found that it is very important to ensure that the application is organized to ensure that the data transfer process from the storyboard to the application to the actual application can be carried out smoothly without any interruption.

Yes, very organized. For me, the way to go forward and back has its own icon and is easy to use. So, students will understand (R3).

In addition, the use of color plays a very important role in ensuring that the type and color of writing chosen is easy for application users to see. Therefore, the selection of colors is highly emphasized so that it can be optimally used by users.

Mixed colors. I want to say again. You have to know that you are making a product for other people, so you have to know your target which is to be measured by their eyes. If possible parallel with one color only (R1).

4.2.3 Application improvement suggestions

The results of the interview found that some suggestions were given by all respondents. Among them are as follows: a) using one's own photo to avoid actions from Google to produce original work; b) using games based on learning, especially in mind testing activities; c) the colors must be parallel to ensure that the application user can use the application fully; and d) include background music to ensure users are not bored when opening the Metal Casting application.

5. Discussion

The results of the interview found that some suggestions were given by all respondents. Among them are as follows: a) using one's own photo to avoid actions from Google to produce original work; b) using games based on learning, especially in mind testing activities; c) the colors must be parallel to ensure that the application user can use the application fully; and d) include background music to ensure users are not bored when opening the Metal Casting application.

In addition, the advantage found in this application is the design element of the Metal Casting mobile application interface. The use of the Metal Casting application in the teaching and learning process needs to be carefully planned in order to ensure that the process of delivering information to students is more effective. Therefore, to ensure that the delivery process is more effective is to ensure that the design elements of the Metal Casting mobile application interface is to ensure that it is attractively designed. Based on the interviews conducted, almost all respondents agree that the size and type of text used in the application is very appropriate. Even so, there are also some shortcomings found in this application, which is the use of questions in the form of answer choices on the mind test, causing students to be unable to develop their own ideas when answering mind test questions for reinforcement activities while using the application (Nikolopoulou, 2018). This is because most of the structured questions are very suitable for university students.

In addition, the use of images from Google as a teaching aid is no stranger in the world of education. However, if the application is patented, the developer cannot get real results for the developed application. In addition, developers can be sued if they want to obtain copyright because the images used belong to Google. Regarding the state of technology today that is growing, technology has become a necessity in human life (Holtgrewe, 2014). In one semester, the researcher has successfully developed a Metal Casting application. This application works well to achieve the goals stated in the objectives in the north at the beginning of the writing. It is true that developing an app takes a lot of time and effort to be successful. In addition, the appropriate research methodology needs to be defined as a comparison between existing models and the best. Then, after choosing a model for the methodology, the phases in the model must be

carefully resolved to ensure that the application being developed runs smoothly. It is natural in life that every advantage and disadvantage will be there. Likewise with applications that have been developed. Finally, the time constraints experienced by developers make development unable to choose the best software because the software used to develop mobile applications has functional limitations. At the same time, researchers need more time to explore this software considering the short, allotted time to complete the application.

6. Conclusion

Overall, the development of this Metal Material Technology Casting application aims to assist lecturers in providing teaching aids that can be used in the teaching of the VDT3023 Manufacturing Technology course. Indirectly it can overcome the problem of lack of teaching aids based on multimedia technology. Considering that the use of android applications is more suitable for the era based on sophisticated technology, such an approach has shown a positive perception from the lecturer of VDT3023 Manufacturing Technology. It is hoped that the production of this Metal Casting application can also be added value to teaching and learning in Manufacturing Technology. The acceptance and positive perception from the respondents towards the Metal Casting android application as one of the teaching aids has illustrated a positive direction in the improvement and improvement of the application.

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Conflict of Interest

The authors declare no conflicts of interest.

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