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Development of the Android-Based Mobile Application 'Mywheel Alignment' for Wheel Alignment Topics in Automotive Technology Courses at Vocational Colleges

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Abstract: This study was conducted to develop an android-based mobile application Mywheel Alignment for the topic of wheel alignment in the Automotive Technology course at the Vocational College. This study involves the approach of constructivism theory and cognitive theory of multimedia learning in the foundation of application construction to help create effective alternative learning features. The Mywheel Alignment application is a learning support resource that features the main multimedia elements such as text, graphics, animation, audio, and video to help improve mastery of the topic of wheel alignment interactively. Thus, the design used is product development while the development process follows the ADDIE model which includes aspects of analysis, design, development, implementation, and evaluation. This study uses a qualitative design through a semi-structured interview method involving five experts who have experience and expertise to carry out the evaluation and determine the usability of the application. The data obtained from the interview results were analyzed using the content analysis method to construct codes and interview themes. The findings of the study show that all respondents agree on the pedagogy and curriculum of Automotive Technology, the use of language as well as multimedia and techniques used in the MyWheel Alignment application. Data analysis of students was also done by using a questionnaire to obtain feedback from real users involving 25 Automotive Technology Diploma students at the Vocational College. This android-based mobile concept learning application can provide benefits and added value to users in line with the advancement of educational technology to produce more quality Vocational College graduates towards meeting the needs of the industry in line with the vision and mission of the Malaysian Ministry of Education.
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Keywords: Vocational Education; Mobile Application; Automotive Technology; Undergraduates; Technology Application

1. Introduction

The advancement of technology has resulted in several benefits and advantages in the creation of curriculum and pedagogy, particularly in the field of education. With the Malaysian Ministry of Education's (KPM) attempts to promote vocational training, the technological era has also transformed the landscape of technical and vocational education in Malaysia. The goal is to ensure that the training is job-specific and highlights industry practices in many relevant sectors (Yusof et al. 2020). The Malaysian Ministry of Education (KPM) expects 70% of Vocational College graduates to satisfy industrial demands, 20% to continue their education, and 10% to enter the field of entrepreneurship. Graduates who are going to be born are extremely significant and must be supplied with comprehensive information and skills following the industry's demands and standards. As a result, educational institutions must take a proactive role in ensuring that prospective graduates have high employability when they enter the real world (Asrin 2019).

Changes occur through mobile conceptual learning to increase the degree and quality of learning, following the current modernity. according to the statement of Younes et al. (2021) The delivery of learning utilizing mobile devices, especially smartphones, can inspire students to actively participate in learning. The concept of learning by involving various multimedia like this has become a trend nowadays, especially among teenagers (Fauziah & Shaharuddin 2020). It can

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even bring extra value and suit the demands of teens now, in the notion of presenting more fascinating information, in conjunction with contemporary technologies (Tamrin, 2021). At the same time, it can solve problems and change the perception of students, especially students who have problems in learning (Supermaniam et al. 2021). Changes in education are required to further strengthen the 21st-century generation's learning potential as well as their ability to swiftly acquire new skills (Engku Muhammad et al. 2021).

According to the Information and Communication Technology (ICT) Transformation Plan of the Malaysian Ministry of Education (KPM) 2019-2023, a strong ICT infrastructure needs to be provided to meet current issues and support the new application environment. This is because of its importance in relationships and communication, as well as its benefits in learning (Sheila et al. 2020). At the same time, it can help students develop conceptual and more systematic workflows (Modesti, 2021). Teaching materials may be provided quickly, resulting in more effective learning through knowledge sharing (Hamzah et al. 2020). In other words, this current learning pattern may allow prospective Vocational College graduates to be more competitive in the sector while joining the real job area. Thus, all parties must support efforts to strengthen technical and vocational training to generate locally trained employees as the main pulse of national growth.

2. Method

The design for this study is a product development study design. Therefore, the research carried out is to develop an android-based mobile application using Adalo software entitled MyWheel Alignment for the topic of wheel alignment. One of the subjects covered in the DMD 3143 Vehicle Chassis System II module for the Automotive Technology Diploma Program at the Vocational College is wheel alignment. Purposive sampling is employed, with five specialists involved who have experience and knowledge in Automotive Technology pedagogy and curriculum, as well as language, multimedia, and technical with an emphasis on the study undertaken. The purposive sampling method is used by involving five experts who have experience and expertise in Automotive Technology pedagogy and curriculum, use of language as well as multimedia and technical with a focus on the research conducted. The selected population consists of Education Service Officers at the Malaysian Ministry of Education and Lecturers at Vocational Colleges who have experience ranging from 14 years to 32 years in the field they are engaged in. Therefore this study uses a qualitative approach through a semi-structured interview method. Hence the content analysis approach as suggested by Miles dan Huberman (1984), Burn (1995) dan Merriem (1998) was used to analyze the interview data obtained according to the themes to determine the usability of the application that was carried out. This study also obtained feedback data from 25 students to obtain views from real users by using a questionnaire.

Because of the model's design, which stresses the feature of repetition that may be done for each step, the ADDIE model was picked in the procedure of developing this application Allen (2017). This is because each phase is depending on the other. Therefore, if the phase cannot be executed effectively, then the procedure may be repeated until everything can be done entirely and in an ordered manner. Rosset developed the ADDIE model in 1987, and it is frequently used as a basis for various instructional design approaches. according to Forest, (2017) continuous improvements can be made based on the information gathered. This model serves as a guide to develop applications regularly according to the processes that have been determined to produce the best quality applications (Alghazzawi et al. 2021). Figure 1 shows the design of the ADDIE model used in the development of this application.

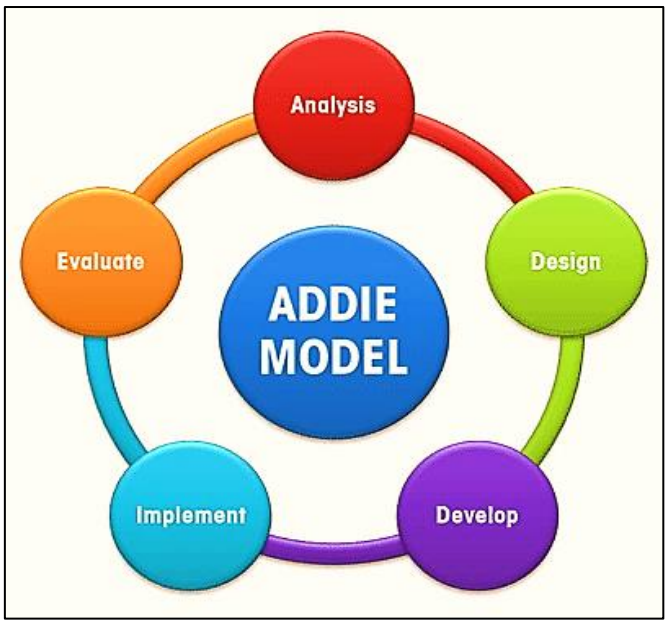

Fig.1: ADDIE Model Design

2.1 Analysis Phase

The ADDIE paradigm begins with the analysis phase. As a result, the research focuses on the analysis of application development demands, the analysis of learning challenges, and the identification of teaching objectives (Fkrudin et al. 2018). Furthermore, educational challenges, learning objectives, and student knowledge and abilities are thoroughly recognized (Saad et al. 2018). The function of a wheel alignment is to ensure that the driven vehicle moves in perfect condition and to obtain grip between the wheels and the road surface. Therefore, a vehicle must have a good wheel control system when turning or when the vehicle is moving straight (Kim & Lee, 2020). The wheel alignment process which includes checking the correct angle of the wheel is the main thing in the automotive field (D'Mello et al. 2022). Wheel alignment checks must be done periodically on every vehicle (Sulaiman et al. 2021). Therefore, the goal of this study is to develop an android-based mobile application titled MyWheel Alignment as a learning support resource in helping students master the basics of wheel alignment, camber angle, caster angle, and toe angle interactively. The main target users are Malaysian Vocational Diploma (DVM) level students who are taking Automotive Technology courses at Vocational Colleges. The development process of this application is based on the Automotive Technology learning module based on the Vocational College Standard Curriculum (KSKV) that has been set by the Malaysian Ministry of Education (KPM). The process of analyzing the development needs of this study involves lecturers for Automotive Technology courses at Vocational Colleges and Education Service Officers at the Vocational Technical Education and Training Division, Ministry of Education Malaysia.

2.2 Design Phase

This phase involved defining and creating cooperative learning techniques, practical learning, and demonstrative learning. At the same time, describe the general look of the shape, structure, theoretical approach, medium type, and technology employed (Karnain, 2020). This is because student understanding of learning topics can be improved by the presence of multimedia stimuli in teaching sessions (Ejiyi et al. 2021). The My wheel Alignment application's development also includes the use of multimedia elements such as text, images, music, video, and animation. Every piece of multimedia information plays a unique function in making information more entertaining and effective for users (Yossie et al. 2020). The use of graphics that coincide with the steps of the practical work is important so that students understand each inspection and adjustment process that needs to be done. In learning the theory of the use of colored graphics with the help of simple and easy-to-understand explanatory notes so that learning can achieve the real goal. The use of moving animation helps the user visualize the work being delivered and at the same time can brighten up the delivery process (Rusli et al. 2019). The use of video and audio that further explains wheel alignment, toe angle, camber angle, and caster angle can be repeated more easily. Users can even watch explanatory video clips to form a deeper understanding when needed (Kamlin & Keong, 2020). Thus this process involves the production of application activities that relate to other activities more clearly according to dynamic aspects. Figure 3 shows the activity of the MyWheel Alignment application.

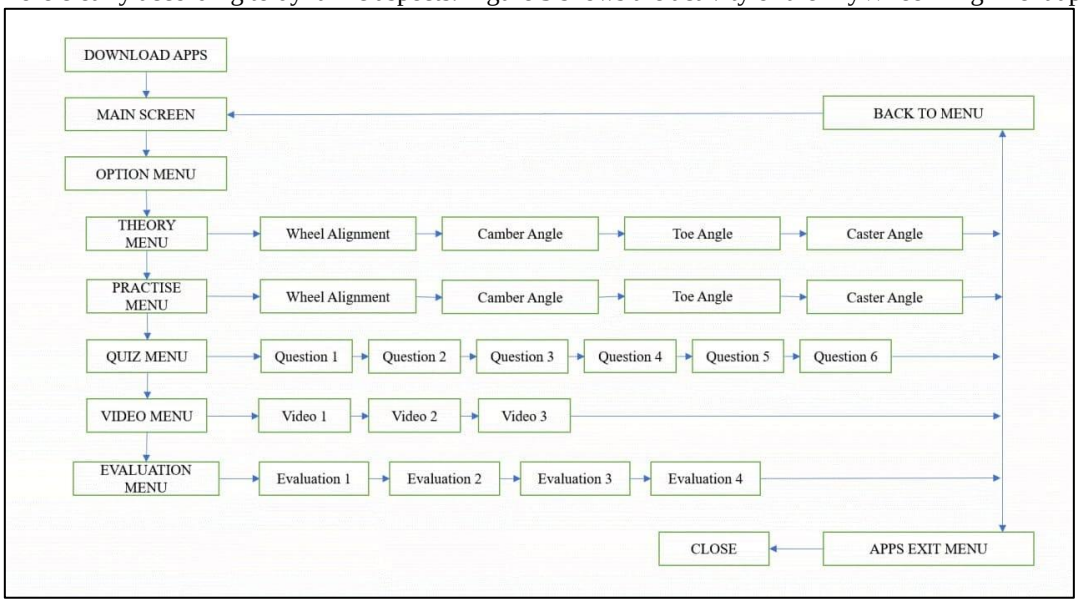

Fig. 2: MyWheel Alignment application activity

2.3 Development Phase

Each learning material arrangement is based on a design that was created and translated into application development using Adalo software. The development phase is the step in which application media is created based on the design that has been established to achieve learning objectives (Ghofur & Youhanita, 2020). The following is a display of the MyWheel Alignment application interface:

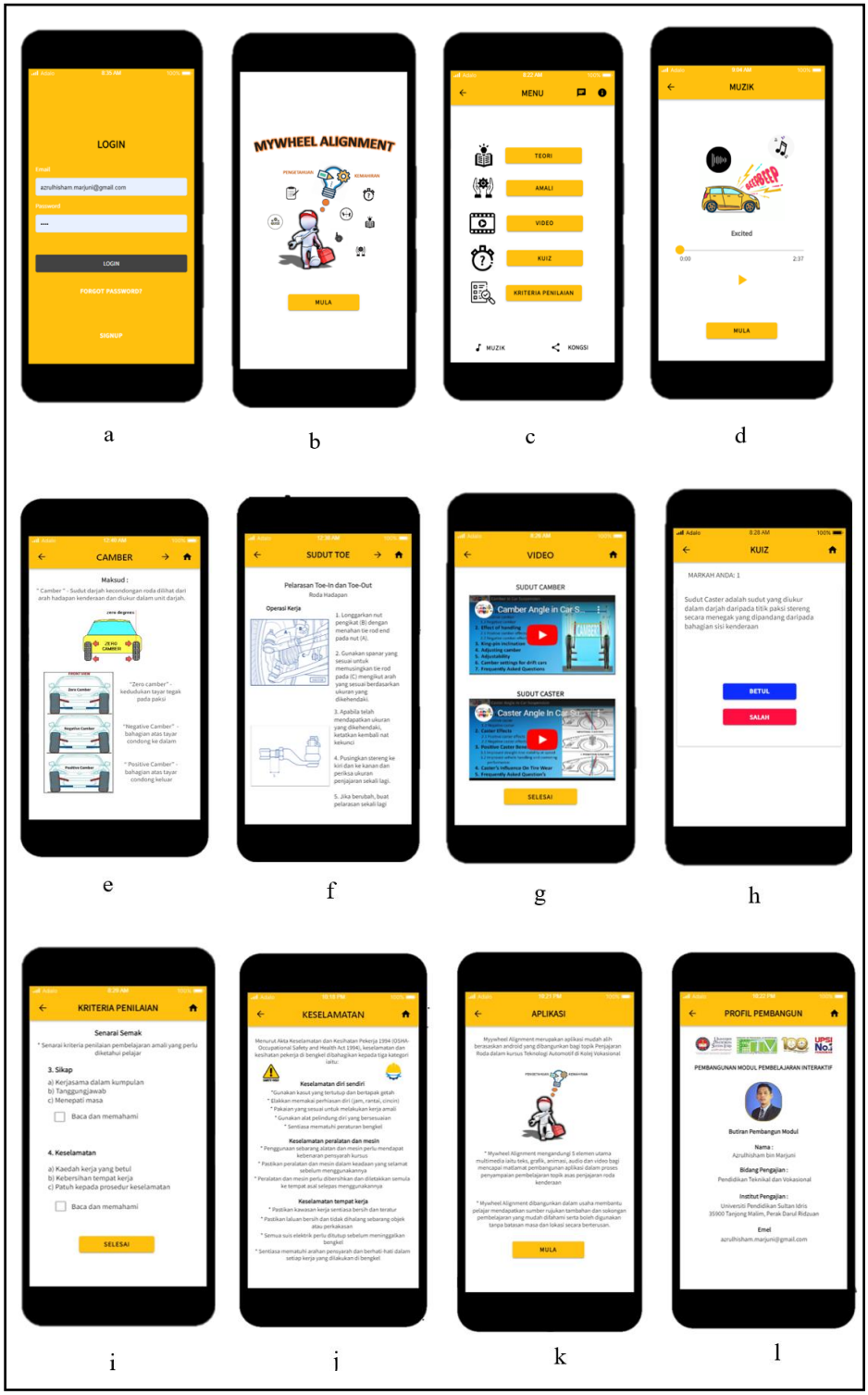

Fig. 3: MyWheel Alignment Application Screen Display: (a) Application Login (b) Home Screen (c) Options Menu (d) Music Display (e) Theory Learning Display (f) Practical Learning Display (g) Video Display (h) Display Quiz (i) Evaluation Criteria View (j) Security View (k) Application Info View (l) Developer Profile View.

2.4 Implementation Phase

The implementation phase in the ADDIE context refers to the development and design of the teaching materials that have been prepared to be implemented according to the actual development goals. Thus this phase also involves the formative evaluation that is developed and making adjustments and improvements in case of errors before it is fully used by users (Stapa et al. 2019). In this study, the implementation phase is critical for identifying mistakes during the application development process. Every remark and advice provided by the expert is examined and improved to achieve high validity (Alwi et al. 2019). Next, the completed MyWheel Alignment application using Adalo software is converted into an Android Application Package (APK) file on an Android-based system before being downloaded to a mobile smartphone. Figure 5 shows the testing process of the Mywheel Alignment application.

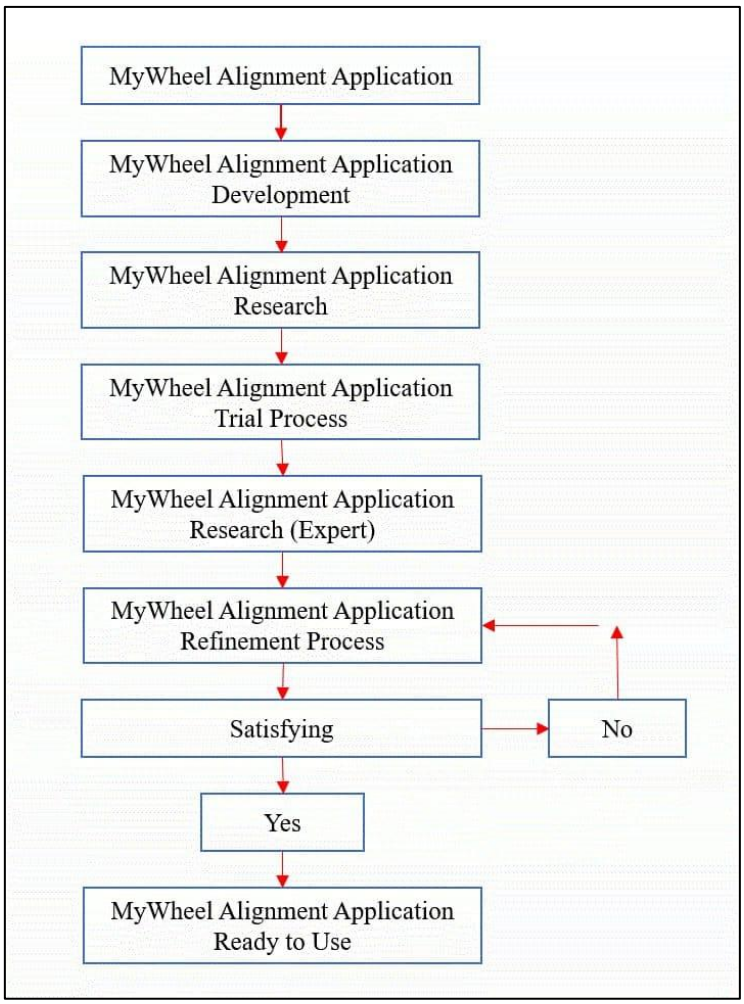

Fig. 4: Mywheel Alignment Application Testing Process

2.5 Evaluation Phase

The evaluation phase is the last in the ADDIE Model. Therefore, the process of evaluating the developed application is to get feedback on the entire development that has been produced. Therefore this phase covers all levels in the ADDIE model such as the analysis phase, design phase, development phase, and implementation phase. This phase involves two main types of assessment which are formative assessment and summative assessment. Formative assessment is implemented at each level in the ADDIE Model. While the summative evaluation is the evaluation of the entire application that has been produced. The Mywheel Alignment application has undergone a process of improvement and refinement according to the planned procedure. Therefore every view and suggestion from five experts who have expertise and roles in pedagogic and curriculum aspects, language use as well as multimedia and technical to determine usability before the application is fully used by users. The usability of a product includes efficiency, effectiveness, and user-friendliness (Mahamsiatus et al. 2021). In addition, this study also obtained feedback data from real users by involving a total of 25 Automotive Technology diploma students at Sungai Buloh Vocational College, Selangor by using a questionnaire. This evaluation is important because it can improve the quality and level of usability of the developed application (Azmi et al. 2018). Table 1 shows the expert criteria by category.

Table 1: presents the expert criteria for each category.

Expert Category	Background	Experience
P1 (Language)	Chief Assistant Director at Vocational Technical Education and Training Division, MoE. Experience and expertise in the publication of MoE Textbooks, Editor of Empowerment books and TVET Manuals, MoE TVET feedback and issue coordinator, Division Annual Report Coordinator, MoE Debate Wrap-up text coordinator, and Division speech text coordinator.	32 years
P2 (Multimedia and Technical)	Lead Trainer of the 3D Animation Program, National Program Coordinator (PPK) of the 3D Animation Program, Head of the Final Evaluation Item Drafting Panel for the Diploma Program, and Lecturer of the Creative Multimedia Animation (3D) Program at the Vocational College.	19 years
P3 (Pedagogy and Curriculum)	KV Skills Lead Trainer (Automotive), Skill Expertise Referral Partner (RRKK) KPM (Automotive), Skills Program Accreditation Evaluation Panel, lecturer in the field of Automotive Technology.	30 years
P4 (Pedagogy and Curriculum)	Head of the Automotive Technology course Program at the Vocational College, KVSB Automotive Motorsport Coordinator, Diploma Lecturer of the Automotive Technology Program at the Vocational College	23 years
P5 (Pedagogy and Curriculum)	Head of Automotive Technology Course Program at Vocational College, Lecturer of Malaysian Vocational Certificate and Automotive Technology Diploma at Vocational College	14 years

3. Findings

Overall, based on the interview findings, all respondents agreed on the use of language, multimedia, and technical components, as well as pedagogy and curriculum, on the MyWheel Alignment application. Table 2 below shows the findings of interviews with experts that have been carried out.

Table 2: Findings of interviews with experts

No	Item	Expert View
1.	Language usage	• The use of language is clear and appropriate to the level of students at the Vocational College - the level is not too high. • Each use of words on each application interface is easy to understand even by using simple sentences. • Free from spelling and sentence writing errors.
2.	Multimedia dan Teknikal	• The design and multimedia elements used in the Mywheel Alignment application are interesting. • The use of appropriate color combinations as well as an orderly arrangement of content. • The resulting screen display is simple, easy, and user-friendly - learning activities can be done comfortably and interestingly. • Searching for information and info related to the topic can be done quickly and smoothly. • The icon and navigation buttons work fine.
3.	Pedagogi dan Kurikulum	• Information and activities that are simple and clear, easy to understand • The use of notes is not too much and not too complicated according to the topic. The application is very suitable for KV students • The content of the application is built by the content of the Course Outline (CO) and according to the stipulations of the learning module • Rules and safety practices involving people, equipment, and workshops are also implemented • The content that is built takes into account aspects of self-learning • Suitable as a place to make references and review • The application is very timely and covers theoretical and practical learning

While the feedback data obtained through a questionnaire for a total of 25 Automotive Technology Diploma students at Sungai Buloh Selangor Vocational College showed that 99.2 percent agreed with the technical multimedia aspect and the learning aspect of using the MyWheel Alignment application. The following is the feedback received from users of the MyWheel Alignment application :

Table 3: Questionnaire for MyWheel Alignment application users

No.	Item	Percentage (%)
1.	The text used is clear and easy to read	100
2.	The use of colors in the MyWheel Alignment application is appropriate and attractive.	96
3.	Colorful graphics that match the learning of the topic	100
4.	The buttons on the My Wheel Alignment screen are easy to access.	96
5.	The navigation icons used are user-friendly	100
6.	The icons used work well and are easy to use	100
7.	The pictures used are relevant to the explanatory notes and practical work steps	100
8.	Animation helps in understanding the topic and is interesting	100
9.	The screen instructions are easy to understand	100
10.	Use of appropriate and clear audio	100
11.	The music used creates a cheerful and interesting atmosphere	92
12.	The videos used help the understanding of the topic	100
13.	The displayed video is easy to understand	100
14.	Simple and attractive screen design	100
15.	The MyWheel Alignment application is easy to use and user-friendly	100
16.	Simplify the process of learning the topic of wheel alignment	100
17.	*MyWheel Alignment can create a true picture of vehicle wheel alignment*	100
18.	The workshop safety information description is clear and easy to understand	100
19.	*MyWheel Alignment is easy to use for self-study*	100
20.	*MyWheel Alignment can help improve understanding of topics*	100
	total	**99.2**

4. Discussion

The development of an android-based mobile application was studied to help students better their comprehension and mastery of the issue of wheel alignment for the Automotive Technology course at the Vocational College. Furthermore, students can use a smartphone to access additional reference resources and simple learning help on vehicle wheel alignment based on the DMD 3143 Vehicle Chassis System II module. The creation of the Mywheel Alignment android-based mobile application also includes the use of multimedia components like text, images, music, video, and animation, all of which play a part in making information more attractive and effective for users. Meanwhile, the theory and model that underpin the development of this application may be used to apply technical skills in a more participatory and current learning approach. As a result, the creation of this application is a current prerequisite for Automotive Technology students looking to further their knowledge and abilities in the area of vehicle wheel alignment.

5. Conclusions

It is possible to infer that studying using this android-based mobile concept application offers new chances to assist autonomous learning through technological resources in education that are tailored to the educational demands of the twenty-first century. Simultaneously, it has a good influence on diversifying learning patterns by delivering more interactive instruction in keeping with current technology advancements. It even gives benefits and added value to students in an endeavor to generate more quality Vocational College graduates to satisfy the demands of the business following the Malaysian Ministry of Education's vision and goal.

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