The Development of Mobile Application Software MyNutrient in Home Science Subject

Mohamed Nor Azhari Azman[1*], Syakirah Ruslan[2],Zahidah Ab-Latif[3], Hendri Pratama[4]

[1 2 3 4]Faculty of Technical & Vocational, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Malaysia
mnazhari@ftv.upsi.edu.my
sykrhrsln98@gmail.com
zahidah@ftv.upsi.edu.my
hendripratama.tvet@gmail.com
Corresponding Author

https://doi.org/10.24191/ajue.v19i1.21232

Received: 22 November 2021
Accepted: 22 December 2022
Date Published Online: 31 January 2023
Published: 31 January 2023

Abstract: The objective of the current study was to develop a mobile application to aid problems faced by students in the subject of Home Science. Previous studies have discovered that that many students struggle to understand topics related to nutrient content, nutritional practices, the digestive and absorption systems. Therefore, a mobile application known as MyNutrient was developed in accordance to the content of the standards of Food Needs, Nutrients, and Functions found in the Food and Nutrition topic in the Home Science subject. The development process of MyNutrient was based on the ADDIE model. This study later employed a qualitative method. An interview was conducted with three experts with expertise in the Home Science field and a good understanding of the design and evaluation of instructional materials. The findings reveal that MyNutrient consists of content that is aligned with the Standard Curriculum and Assessment Document (DSKP). It also helps users, especially students, in strengthening knowledge related to the Home Science subject through its interesting and engaging design, navigation, and user interface. It is hoped that the use of MyNutrient can improve the quality of Home Science subject in Malaysia.

Keywords: Mobile Applications, Home Economics, ADDIE, M-Learning

1. Introduction

The conventional teaching method of 'chalk and talk' has become a habit for teachers during teaching and learning sessions. However, as the world of education evolves, an education system that does not rely on traditional methods such as chalk and whiteboards must be developed. This evolution is a result of the Industrial Revolution 4.0 in which the mastery of technological advancement and development has become the most essential skill. In accordance with that, the evolution has necessitated teachers to be creative and innovative in order to improve their teaching and learning methods in line with the latest information technology (Nordin & Hong, 2009). For example, in an interview on the relationship between the History subject and the use of technology, the study respondents found that technology makes History more engaging than a simple recollection of facts and data (Stojšić et al., 2020). Also, integrating MAR or Mobile Augmented Reality in teaching and learning sessions increase student' interest and motivation to learn (Nizar et al., 2019; Pratama et al., 2021; Anuar et al., 2021). Therefore, teachers must find new ways and create new strategies to stimulate students' interest in learning and to aid students' learning comprehension (Basiron, 2012).

Smartphones have become the fastest technology in human history. In addition to providing opportunities to develop the economy (Gilliland et al., 2015), smartphones also serve as the hub of information for student activities that play a vital part in E-learning and E-health. Throughout the world,

there is evidence of the use of mobile technology for educational purposes, for example, in Nigeria (Nwagwu & Odetumibi, 2011). As a result, there are many applications developed for educational purposes, such as Kahoot, Zappar, and Padlet. These applications attract many students due to the integration of icons, graphics, pictures, audio, and video, making the learning process more engaging and fun than conventional teaching methods. Undoubtedly, integrating information technology into the educational system has improved the quality of teaching and learning.

Currently, there is a rapid expansion of M-mobile interventions for delivery modes, such as e-Health technologies via web-based delivery (Letchmanan & Saad, 2021; Zainuddin et al., 2021). The expansion has led to the creation of a term known as 'm-health'. M-health refers to the concept of using mobile devices, such as mobile phones, personal digital assistants (PDAs), tablets, wireless devices, and smartphones, in the field of medicine and public health (Villinger et al., 2019). One of the e-Health applications is the m-health application that is available for download through the two largest mobile operating systems: Google Play Store for Android and iTunes App Store for iOS (Franco et al., 2016). The application receives greater attention than the conventional means of accessing health information.

According to a study on the effectiveness of training actions utilising traditional means and digital resources, such as mobile applications, in programmes promoting healthy eating and an active lifestyle, the study sample favours digital resources over conventional approaches (Marín-Marín et al., 2020). In addition, an Australian study on the impact of mobile applications on overweight individuals demonstrates the positive influence of m-health applications on health information accessibility. The study found that the application assisted the participants' weight loss and influenced their sugary drink intake, resulting in a 0.5% decrease in HbA1C levels (Campbell & Porter, 2015). Food consumption evaluation is important for nutrition and clinical practice epidemiological studies, including dietary counselling. While traditional dietary assessments rely on the interviewer or pen-and-paper method, technological advances have resulted in innovative electronic approaches, such as web-based diet records (Shinozaki & Murakami, 2020). As a result, mobile applications focusing on food and health should be developed because they benefit not only health and consumer nutrition but also the world of education.

In Malaysia, Home Science is one of the most significant subjects in the Malaysian education system because it is designed to provide knowledge, values, and skills regarding daily life (Shahali, Ismail, & Halim, 2017). One of the main topics found in the subject is Food and Nutrition. This component teaches students about food, nutrition, the functions of nutrients in the human body, digestion and absorption systems, diet practises, food label identification, and menu planning. Recent calls have been made to incorporate m-learning into the subject, as the learning method is not limited to a single discipline. M-learning, a method of learning that employs mobile and wireless devices such as smartphones, PDAs, and laptops, enables the development of software applications for various purposes and fields. Kukulska-Hulme and Jones (2012) underline the importance of facilitating learning processes that are not tied to the physical location of the learning process. Accordingly, the application of m-learning frees students from time and geographical constraints, allowing them to learn at any time and place. Due to the widespread effect and feasibility of technology, the mobile learning method or m-learning has been selected as a viable option for teaching and learning sessions that could stimulate students' interest in learning and aid their learning comprehension (Rahim, 2013). Therefore, there is a need to develop m-learning software specifically for the subject of Home Science.

2. Methodology

The current study utilised the ADDIE model that served as a guide for the methodical development of the study's developed mobile application. The acronym ADDIE, which stands for design, development, implementation, and evaluation, describes the fundamental divisions and processes required for a project. This model was selected because it emphasises phase repetition, with each phase being interconnected. Therefore, failure to effectively implement a phase results in the repetition of that phase until its objective is met. The flow process of the ADDIE model can be seen in Figure 1.

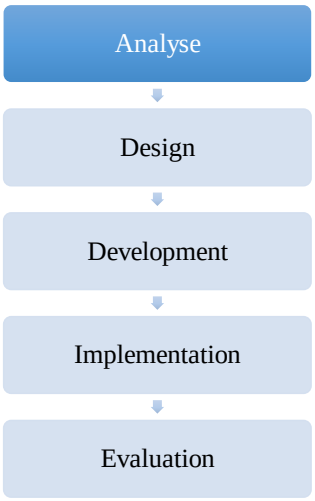


Fig. 1 The flow process of the ADDIE model

The development process of the study's mobile application was structured according to the ADDIE model. Thus, there were five distinct phases. The first phase, analyse, was the analytical phase. The second phase, design, involved the development of learning materials. During the third phase, development, learning materials and activity plans were created. In the fourth phase, implementation, the learning materials and activities were executed. In the final phase, assessment, the complete software was tested and evaluated.

2.1 Phase of Analysis

The first phase consisted of an analysis to determine the objectives of the developed mobile application and the challenges it solves. The current study believed that creativity and innovative thinking among educators could support the process of educating (Balakrishnan, 2022).

According to a study by Yahaya and Hashim (2008), Home Science is one of the hardest subjects to pass due to the integration of science concepts in this subject. The use of the unfamiliar name of nutrients, for instance, made the subject difficult for students as it requires memorisation. Therefore, a mobile application was developed in the current study. MyNutrient, a mobile application, intended to help students in learning the Food and Nutrition topic through the use of more interesting and creative infographics. The use of infographics and general images in the application could also facilitate the identification of nutrients and their sources, as well as the memorisation of the unfamiliar names of nutrients.

2.2 Phase of Design

After completing the analytical phase, the next phase is the design phase. This phase entails designing learning material by determining the overall form, structure, theoretical approach, medium type, and technology employed in the MyNutrient mobile application. This phase is crucial because it involves strategic planning for software development and the detailing of methods to attain the objectives of the mobile application. Steps taken in the design phase include project documentation, developing storyboards, designing interfaces, developing prototypes, and using visual design. MyNutrient contained information about the application, notes on the Home Science subject, general additional information, and an intelligence quotient (IQ) test. Figure 2 shows the storyboard of MyNutrient.

(a)

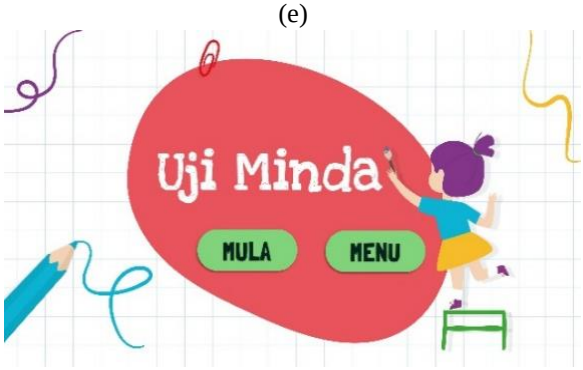
(b)

(c)

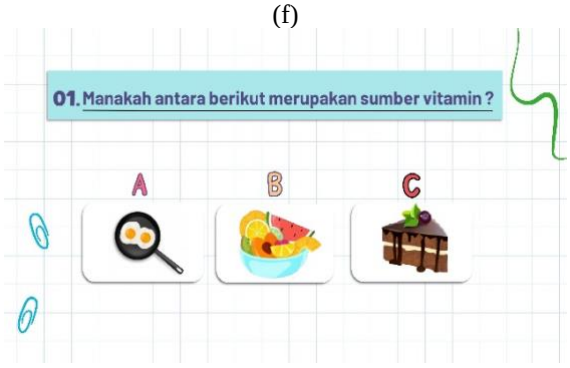
(d)

(e)

(f)



(g)



(h)

Fig. 2 (a) Interface of MyNutrient content; (b) Interface for Application Info; (c) Note Page; (d) Interface for Note Content; (e) Interface for the Content of Carbohydrate; (f) Interface of Additional Info; (g) Interface for Mind Test; (h) Interface for Mind Test Question

In general, MyNutrient not only provided the information covered in the Home Science subject, but also exposed users to the prevalent nutrition-related issues in Malaysian society. There were also questions for students to evaluate their understanding of the learning materials which helped make learning more efficient and effective for users. In addition, it was decided that suitable text, audio, video graphics, and other types of multimedia were included in the developed mobile application during this phase. It was determined that multimedia elements were utilised in MyNutrient as many mobile

applications today fail to utilise the elements, resulting in their applications and websites be static and not dynamic (Ibrahim & Harun, 2018). Also, the use of multimedia elements differentiates m-learning from conventional teaching and learning, in which teachers only read the materials in front of the students while the students listen (Hussein, 2006).

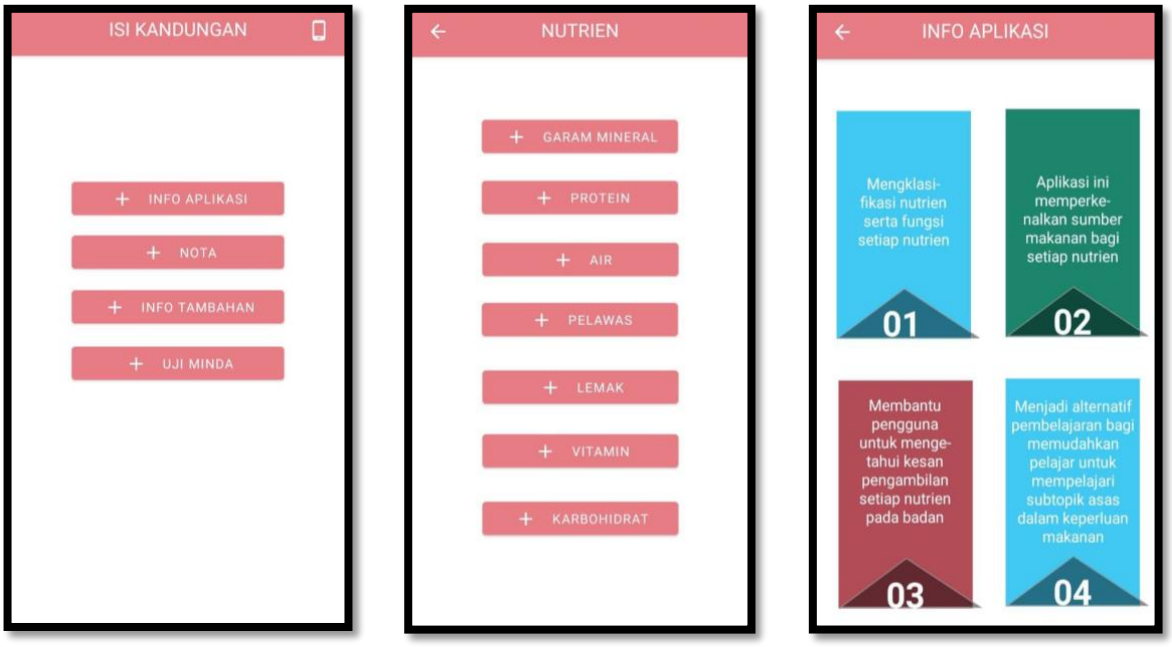
2.3 Phase of Development

The third phase is the development phase. This phase is highly influenced by the decisions made during the analysis phase. During this phase, the real systems are constructed using appropriate media and technology elements according to the objectives of the developed mobile application.

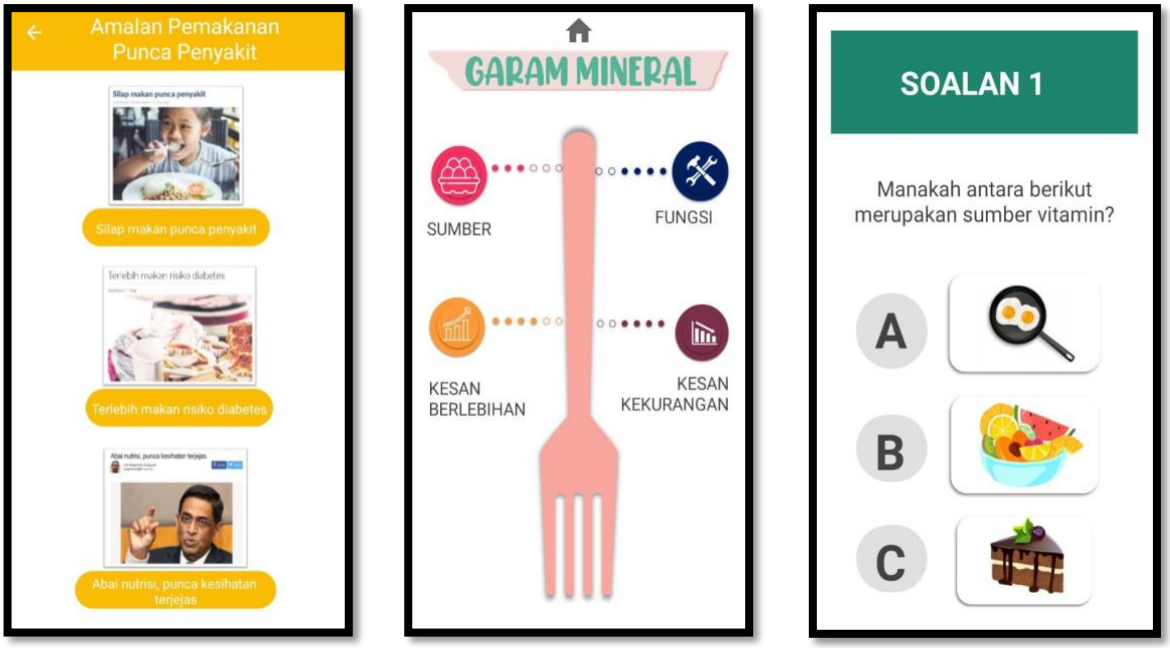
In the current study, the development of the software and learning materials of MyNutrient were based on the results of the discussion during the design phase. To execute the developmental plan of the current study and build an application, AppsGeyser software was utilised. Continuous testing was conducted on every development to ensure that MyNutrient operates smoothly and efficiently.

2.4 Phase of Implementation

In the fourth phase that is the implementation phase, the software and teaching materials that have been designed are used and tested in real form. This phase involves the process of using software or learning modules in a real-world context. The implementation phase is very important to identify errors during the process of software development. It provides an opportunity for researchers to make improvements if there is any error occurs before it is fully utilised by the user. Figure 3 shows the developed MyNutrient mobile application, where shows the content of MyNutrient which consists of application information, notes, additional information and quiz. The presentation of the mobile application is important on choosing the right keywords and avoid long sentences as well as attractive colour and infographic presentation to ensure MyNutrient provide user friendly application.



(a) (b) (c)



(d) (e) (f)

Fig. 3 (a) The MyNutrient Content Interface (b) The MyNutrient Content Interface (c) The Application Info Interface (d) The Interface for Food Practice that can cause Disease (e) Interface for Mineral salt Content (f) Mind Test Question Interface

2.5 Phase of Evaluation

The evaluation phase is the final phase in the ADDIE Model. This phase involves two types of assessment: formative assessment and summative assessment. Formative evaluation is implemented at each stage in the ADDIE Model to test and ensure its effectiveness (Davis, 2013). This evaluation is important because it provides an opportunity for researchers to improve the level of effectiveness of the developed software. On the other hand, summative assessment refers to a specific and continuous testing process (Kibble, 2017). It requires users' feedback in terms of content, selected learning methods, and multimedia elements used in the software.

The current research employed a qualitative method by conducting a structured interview with a total of three experts. The experts, which were selected based on the same characteristics and criteria through non-random sampling, were asked to evaluate and validate MyNutrient. Data and information based on the views and opinions of the selected panels as a result of the interview were gathered.

3. Findings

The reliability of the data collected for the current study was verified through interviews with three experts. The experts had extensive knowledge of the Home Science subject (SRT) and the field of food and nutrition, as well as the design and evaluation of multimedia teaching materials. A set of interview questions consisting of three (3) parts, namely, Part A, Part B, and Part C, was developed for the interviews. A total of ten (10) questions regarding MyNutrient were posed to the experts for them to evaluate the effectiveness of the developed mobile application.

Part A consisted of questions related to the background of the experts, including personal information, educational background, and experience in Home Science. The summary of the expert's background is displayed in Table 1.

Table 1. Background of Experts

Respondent	Gender	Background	Experience
R1	Female	A lecturer from the Family and Consumer Science Department at the Faculty of Technical and Vocational, UPSI who has experience and expertise in the field of nutrition.	15 years
R2	Male	A lecturer of the Faculty of Technical and Vocational under the Family and Consumer Science Department, UPSI. Has experience and expertise in the field of nutrition.	5 years
R3	Female	A teacher for Home Science (SRT) subject.	5 years

Part B inquired about the content of the MyNutrient mobile application. This section consisted of five (5) questions regarding the content of the application, IQ questions, and suggestions for improvement. Table 2 contains information about the questions in Part B

Table 2. Part B Questions and Experts Opinion

No	Question	Expert Views
1	Does the content of this application relate to the Standard Curriculum and Assessment Document (DSKP) for the subject of Home Science?	MyNutrient mobile application software has the content that coincides with the Standard Curriculum and Assessment Document (DSKP) for Form 4 Home Science subjects in the topic of Food and Nutrition.
2	In your opinion, is the information conveyed in this application are clear and easy to understand?	All panels interviewed gave a positive response by agreeing that the information in the application is clear and easy to understand due to the pictures and graphics are interesting and very clear.
3	What about the mind test questions? Does it coincide with the Standard Curriculum and Assessment Document (DSKP) for Home Science subjects?	The mind-test questions provided are aligned with the content of the Food and Nutrition topics in the Home Science subject. The level of questions is also suitable according to the level of high school students and not too difficult as users might want to learn in a fun situation.
4	Can the content in the application strengthen the user's knowledge of the Food & Nutrition topic?	The content in this application can strengthen the user's knowledge of the Food and Nutrition topic. One of the panels stated that the presence of other content such as current issues about nutrition in this application makes it very informative.
5	In your opinion, what are the suggestions for improvement that can be done from the aspect of application content?	Among the suggestions given by all panels. 1) More usage of specific words and terms such as the word 'Application Info' can be changed to other words such as 'Mission', 'Objective' or 'Learning Outcome'. 2) Add methods or ways users can contact the researchers to ask questions and others. 3) Use other resources than Home Science textbooks such as reference books or food-related books to add more content to the application. 4) The arrangement of the contents should be arranged according to the priority. 5) Incorporate the elements of HOTS to encourage students to think.

Part C focused on the design of the developed application. This section consisted of four (4) questions pertaining to the design elements used, including text, graphics, images, navigation design, interface design, colour usage, and suggestions for improvement. Table 3 illustrates the questions posed by the researchers as well as the three experts' opinions in Part C.

Table 3. Part C Questions and Expert Views

No	Question	Expert Views
1	Are the design elements used in the MyNutrient mobile application such as text, graphics, and pictures, interesting and appropriate?	The application uses an interesting and appropriate design based on the positive response received from all three panels.
2	What about navigation design and interface design, is it interesting and user-friendly?	The app uses an attractive navigation design and interface. All panels agreed that this application is easy to operate and user-friendly.
3	Is the use of mobile applications colour appropriate?	As for the colour used in MyNutrient application, it can be concluded that this application uses the appropriate colour. One of the panels also thought that the colour of the wording was very clear and interesting.
4	In your opinion, what are the suggestions for improvement that can be done from the aspect of design?	There are four (4) suggestions that have been proposed by all panels. 1. Graphic elements are included consistently in each note. 2. The use of musical elements makes this application more interesting. 3. Incorporate entertainment elements such as Quiziz and Google Form into mind test questions to increase students' interest in answering questions. 4. The design on the main display that lists all the nutrients is improved by modifying the circle size of each nutrient.

To facilitate data analysis, a thematic analysis was conducted. Codes were generated based on the transcripts of the interview. Data saturation was verified when no new information was obtained from the interview transcript.

4. Discussion

The evolution of technology has led to the development of mobile applications. This is also prevalent in the education system. The current study developed MyNutrient, a mobile learning (m-learning) application using the ADDIE model (Molenda, 2003). The ADDIE model consists of five (5) phases: analyse, design, development, implementation, and evaluation. As a result, the development process of MyNutrient involved five phases, beginning with analysis to designing learning materials, developing learning materials and planning activities, and finally testing and evaluating the entire software.

During the first phase of analysis, problems were identified. It was discovered that students found the Food and Nutrition topic in the Home Science subject tough and hard to score. This was consistent with previous studies in which the students agreed that the Food and Nutrition curriculum involved a lot of memorisation, making the subject hard and failing to generate critical thinking (Rathi, Riddell, & Worsley, 2017).

The second phase involved designing learning materials and software development. MyNutrient included notes, application details, supplementary information, and an IQ test. This application not only offered knowledge for the Home Science subject, but it also exposed users to nutrition-related problems that were prevalent in this country's society. The test questions helped students assess their learning. In

addition, MyNutrient made use of all media, combining photos and text in a thoughtful and not merely decorative manner (Evans & Clarke, 2019).

During the fourth phase, MyNutrient was implemented. The completed MyNutrient application was presented to typical student users. They were asked for feedback and opinions while exploring the application's features (Evans & Clarke, 2019). This phase successfully exposed problematic application elements.

The final phase was the evaluation by the experts and the launching of the mobile application. In general, the panels agreed that the contents of MyNutrient were suitable for the students. In addition, the content, visual appeal, and colour graphics were clear and engaging. Nevertheless, it was recommended that the application be made more engaging through the use of consistent graphic elements (Tomoliyus, Sumaryanti, & Jatmika, 2016).

5. Conclusion

Nowadays, teachers no longer rely on the use of whiteboards and chalk in the classroom. M-learning is a learning method that has been proven for its effectiveness in today's world of education. Apart from aiming to create a fun learning environment, it also enhances the effectiveness of student learning by removing time and location restrictions. The impact is not only limited to the world of education, but also the field of health because the right use of this technology can lead to a good level of health through the recommendations and guidelines found in related mobile applications.

MyNutrient is developed based on the ADDIE model has greatly facilitated the development of mobile applications. In the current study, the adoption of the model helps MyNutrient to be developed more effectively and efficiently without disrupting learning processes. This is validated through the evaluation conducted by experts at each phase to enhance the quality of the mobile application developed for the current study, MyNutrient.

5. Acknowledgement

We would like to thank all the lecturers from Universiti Pendidikan Sultan Idris (UPSI), particularly the lecturers from the Faculty of Technical & Vocational, for their contributions and opinions that have been extremely helpful in completing this research project.

6. References

Anuar, S., Nizar, N., & Ismail, M. A. (2021). The Impact of Using Augmented Reality as Teaching Material on Students' Motivation. *Asian Journal of Vocational Education and Humanities*, *2*(1), 1-8. https://doi.org/10.53797/ajvah.v2i1.1.2021

Balakrishnan, B. (2022). Exploring the impact of design thinking tool among design undergraduates: a study on creative skills and motivation to think creatively. *International Journal of Technology and Design Education*, *32*(3), 1799-1812. https://doi.org/10.1007/s10798-021-09652-y

Basiron, I. (2012). *Kesan kaedah pengajaran multimedia interaktif dalam pengajaran seni visual* (Doctoral dissertation, Universiti Tun Hussein Onn Malaysia). *Scribbr*. https://core.ac.uk/download/pdf/42953963.pdf

Campbell, J., & Porter, J. (2015). Dietary mobile apps and their effect on nutritional indicators in chronic renal disease: A systematic review. *Nephrology*, *20*(10), 744-751. https://doi.org/10.1111/nep.12500

Davis, A. L. (2013). Using instructional design principles to develop effective information literacy instruction: The ADDIE model. *College & Research Libraries News*, *74*(4), 205-207. *Scribbr*. https://crln.acrl.org/index.php/crlnews/article/view/8934

Evans, S. H., & Clarke, P. (2019). Resolving design issues in developing a nutrition app: a case study using formative research. *Evaluation and program planning*, *72*, 97-105. https://doi.org/10.1016/j.evalprogplan.2018.10.010

Franco, R. Z., Fallaize, R., Lovegrove, J. A., & Hwang, F. (2016). Popular nutrition-related mobile apps: a feature assessment. *JMIR mHealth and uHealth*, *4*(3), e5846. https://doi.org/10.2196/mhealth.5846

Gilliland, J., Sadler, R., Clark, A., O'Connor, C., Milczarek, M., & Doherty, S. (2015). Using a smartphone application to promote healthy dietary behaviours and local food consumption. *BioMed research international*, *2015*. https://doi.org/10.1155/2015/841368

Ibrahim, W., & Harun, H. (2018). *Pembangunan Perisian Multimedia Bagi Subjek Sains Sukan tingkatan 5 Bertajuk Sistem Kardiovaskular* (Doctoral dissertation, Universiti Teknologi Malaysia). *Scribbr*. http://eprints.utm.my/id/eprint/10550/

Hussein, S. (2006). *Keberkesanan penggunaan perisian multimedia dalam pengajaran dan pembelajaran lokus dalam dua matra terhadap pelajar tingkatan dua. (Kajian Berasaskan Sekolah)*. Project Report. Open University Malaysia (OUM), Kuala Lumpur. *Scribbr*. http://library.oum.edu.my/repository/175/

Kibble, J. D. (2017). Best practices in summative assessment. *Advances in physiology education*, *41*(1), 110-119. https://doi.org/10.1152/advan.00116.2016

Kukulska-Hulme, A., & Jones, C. (2012). The next generation: design and the infrastructure for learning in a mobile and networked world. In *Informed design of educational technologies in higher education: Enhanced learning and teaching* (pp. 57-78). IGI Global. https://doi.org/10.4018/978-1-61350-080-4.ch004

Letchmanan, C., & Saad, A. (2021). Keberkesanan bengkel dalam meningkatkan kemahiran teknologi maklumat dan motivasi guru terhadap proses penilaian dalam talian. *Muallim Journal of Social Sciences and Humanities*, 137-149. https://doi.org/10.33306/mjssh/127

Marín-Marín, J. A., Soler-Costa, R., Moreno-Guerrero, A. J., & López-Belmonte, J. (2020). Effectiveness of diet habits and active life in vocational training for higher technician in dietetics: contrast between the traditional method and the digital resources. *Nutrients*, *12*(11), 3475. https://doi.org/10.3390/nu12113475

Meng, C. C., & Idris, N. (2015). Form Four Science Students' Perceptions of the Quality of Learning Experiences Provided by Assessments in STEM Related Subjects. *Asian Journal of Assessment in Teaching and Learning*, *5*, 50-56. *Scribbr*. https://ojs.upsi.edu.my/index.php/AJATeL/article/view/2038

Molenda, M. (2003). In search of the elusive ADDIE model. *Performance improvement*, *42*(5), 34-37. *Scribbr*. http://www.damiantgordon.com/Courses/DT580/In-Search-of-Elusive-ADDIE.pdf

Nizar, N. N. M., Rahmat, M. K., Maaruf, S. Z., & Damio, S. M. (2019). Examining the Use Behaviour of Augmented Reality Technology through MARLCardio: Adapting the UTAUT Model. *Asian Journal of University Education*, 15(3), 198-210.

Nordin, N. M., & Hong, N. C. (2009). Pembangunan dan Penilaian Bahan Pengajaran dan Pembelajaran Berasaskan Web–Webquest bagi Mata Pelajaran ICT (Development and Evaluation of Webquest for Information and Communication Technology Subject). *Jurnal Pendidikan Malaysia*, *34*(1), 111-129. *Scribbr*. journalarticle.ukm.my/213/1/1.pdf

Nwagwu, W. and Odetunmibi, S. (2011). Factors influencing the adoption of mobile telephony by students at the University of Ibadan, Nigeria. *Asian Journal of University Education*, 7(2), 109-142.

Othman, M. A. (2007). *Keberkesanan kaedah pengajaran berbantukan komputer di kalangan pelajar pencapaian akademik rendah bagi mata pelajaran Geografi tingkatan 4 di Negeri Sembilan* (Doctoral dissertation, USM). *Scribbr*. http://eprints.usm.my/id/eprint/29415

Pratama, H., Azman, M. N. A., Kenzhaliyev, O. B., Wijaya, H., & Kassymova, G. K. (2021). Application of augmented reality technology as an interactive learning medium in geography subjects. *News of the National Academy of Sciences of the Republic of Kazakhstan, Series of Geology and Technical Sciences*, *4*(448), 21-29. https://doi.org/10.32014/2021.2518-170X.77

Rahim, N. A. (2013). *Penggunaan mobile learning (m-learning) untuk tujuan pembelajaran dalam kalangan pelajar kejuruteraan UTHM* (Doctoral dissertation, Universiti Tun Hussein Onn Malaysia). *Scribbr*. https://core.ac.uk/download/pdf/20350043.pdf

Rathi, N., Riddell, L., & Worsley, A. (2017). Food and nutrition education in private Indian secondary schools. *Health Education*, *117*(2), 193-206. https://doi.org/10.1108/HE-04-2016-0017

Shahali, E. H. M., Ismail, I., & Halim, L. (2017). STEM education in Malaysia: Policy, trajectories and initiatives. *Asian Research Policy*, *8*(2), 122-133. *Scribbr*. http://www.arpjournal.org/usr/browse/view_issues_detail.do?seq=156

Shinozaki, N., & Murakami, K. (2020). Evaluation of the ability of diet-tracking mobile applications to estimate energy and nutrient intake in Japan. *Nutrients*, *12*(11), 3327. https://doi.org/10.3390/nu12113327

Stojšić, I., Ivkov-Džigurski, A., Maričić, O., Stanisavljević, J., Milanković Jovanov, J., & Višnić, T. (2020). Students' attitudes toward the application of mobile augmented reality in higher education. *Društvena istraživanja: časopis za opća društvena pitanja*, *29*(4), 535-554. https://doi.org/10.55959/di.29.4.02

Tomoliyus, T., Sumaryanti, S., & Jatmika, H. M. (2016). Development of validity and reliability of net game performance-based assessment on elementary students' achievement in physical education. *Asian Journal of Assessment in Teaching and Learning*, *6*, 41-49. *Scribbr*. https://ojs.upsi.edu.my/index.php/AJATeL/article/view/1977

Villinger, K., Wahl, D. R., Boeing, H., Schupp, H. T., & Renner, B. (2019). The effectiveness of app-based mobile interventions on nutrition behaviours and nutrition-related health outcomes: A systematic review and meta-analysis. *Obesity reviews*, *20*(10), 1465-1484. https://doi.org/10.1111/obr.12903

Yahaya, A., & Hashim, S. (2008). *Konsep Sains Dalam Sains Rumah Tangga.* Journal of Science & Mathematics Education. *Scribbr.* http://eprints.utm.my/id/eprint/6357/

Zainuddin, N. M. M., Maarop, N., & Hassan, W. A. W. (2021). Measuring Satisfaction on Augmented Reality Courseware for Hearing-Impaired Students: Adjustment Formula Form SUS. *Nisar*, 17(4), 340-351.