



Adaptation of ADDIE Instructional Model in Developing My Green App for Renewable Energy Learning at Primary Schools in Malaysia

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Abstract

Presently, mobile devices and services have widely been used to enhance the teaching and learning (T&L) process in the educational field due to its positive potential effectiveness. Learning using mobile apps opens new opportunities to improve the quality of T&L at school levels that can help subjects can be learnt more interactively, thus allow pupils to focus more on the subject's contents. This paper proposed the design and development process of My Green App that was purposely designed to expose and enhance the pupils' interest to learn renewable energy subject. This app is mainly suitable for children who aged eleven to twelve years old, i.e. for Fifth and Sixth Grades during learning Reka Bentuk Teknologi (RBT) subject in Malaysian primary school level. ADDIE instructional model has been used and adapted during the design development process for this Green Apps development.

Keywords: ADDIE model, instructional model, green apps, renewable energy, primary school.

Introduction

Nowadays, many educators adopt mobile electronic devices such as tablets and smart phones to provide lessons' materials and assessments, disregards the level of educations. Presently, majority of students starts to use mobile devices at early age, including pre-school children. In global, this situation is exploded since the era of pandemic covid19 in 2020 [1], so does in Malaysia. During such pandemic era, face-to-face teaching & learning (T&L) classes were diverted into online T&L, either synchronous, asynchronous [2] or blended. From the carried-out assessments that have been implemented due to online T&L, it has been found that most of students struggled to master the taught subjects. Hence, national educational performance achievement dropped down compared to before the pandemic, in particular for the science and technology subjects [3][4].

Using web-based, mobile apps or any other internet-based tools may benefit both students and teachers. As educators, it is an integral to explore the best possible opportunities to embrace the curriculum design, particularly when selecting method that could bring students interest in the field of study. This then could encourage students' active engagement which can contribute to students' retention [5]. One of the common and friendly approaches is using mobile app method. To design mobile device application, instructional design approach has been widely used. In [6], instructional design has been defined as *"the systematic and reflective process of translating principles of learning and instruction into plans for instructional materials, activities, information resources, and evaluation"*. Using

this approach, students will be given instructions in a form of effective and profound, therefore helping them better gain, understand and apply effective knowledge, concepts and skills in a short of time.

In instructional design approach, there are numbers of methods are available in the literature such as ADDIE model, waterfall, assure, the Kirkpatrick model, Gerlach-Ely model, TPACK model, dick and carey, hanaffin and peck, and so on [7][8]. In this study however, ADDIE model has been selected as the instructional design approach. All instructional design models require all guided steps should be taken in the exact order. However, with ADDIE model, the circular pattern can be repeated until developers feel satisfied. Besides that, during the last stage (Evaluation stage) of the ADDIE learning model, feedbacks will be analysed to keep improving both the learners' skills and experience.

This study explores the adaptation of ADDIE instructional model in designing and developing a special model learning application for learning renewable energy subject in Reka Bentuk Teknologi (RBT) subject at primary school level by using Android operating system as the platform. The aims of developing this learning app are to provide new learning experience to beginner learners, provide references for them after class, and address the effectiveness of using mobile app-based learning. This study can provide a guideline to develop instructional materials for science learning particularly for Year 5 Grade for RBT subject. In terms of ADDIE model method, it is envisaged that this approach has perfectly considered how students are presumed ideally learn, correct methods and materials have been chosen, right tools have been designed, developed and delivered to the learning group, in which therefore would effectively help students achieve their T&L objectives from the course learnt.

Methods

The mobile app named as My Green App for educational purpose that was carried out under this study was developed using ADDIE instructional model. This ADDIE model, as depicted in Figure 1 [9], comprises 5 phases, represented by Analysis (A), Design (D), Development (D), Implementation (I) and Evaluation (E) of learning materials and activities. The ADDIE model is chosen due to its popularity and effectiveness in instructional technology design to develop more interactive learning applications. This model is easy to implement even have had helps lots of designers to develop more efficient learning modules [8]. Through this approach, learning can be imposed under learner-centered approach whereby students may experience more interactive lessons and more effective to understand the taught contents.

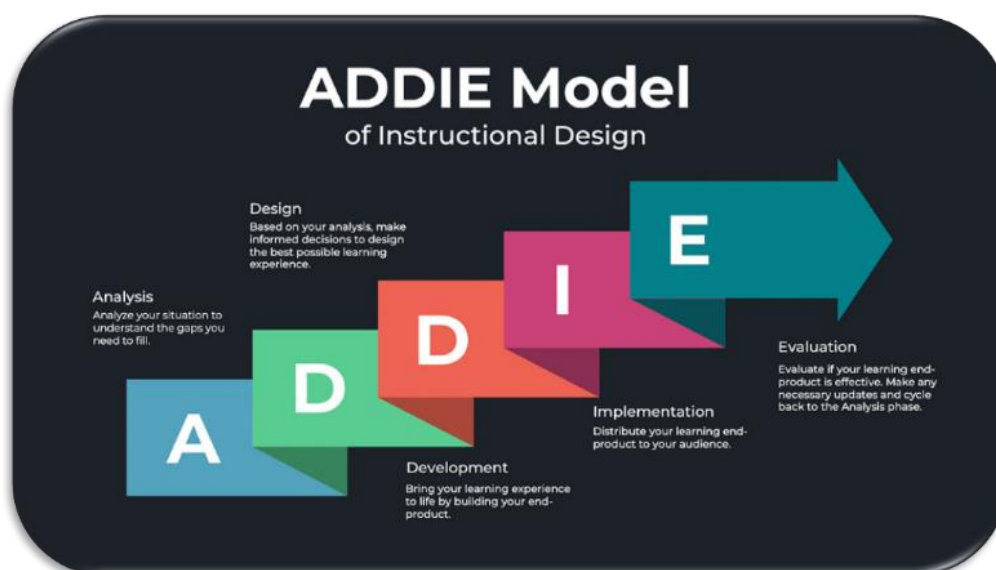


Figure 1 ADDIE Instructional Model

The details of this ADDIE model as explained below:

- A. Analysis: Determine the problem and find possible solutions. The outcome of this phase will be used in the next Design phase.
- B. Design: The contents of My Green App are designed based on the syllabus covered in the RBT Year 5 Text Book, as shown in Figure 2, and also based on the taught lessons that has been imposed in primary schools worldwide. This is to make sure the proposed contents are appropriate with Malaysian educational standard and also parallel to worldwide educational quality. In this stage, contents are designed to be in three-degree performance levels (beginner, intermediate and pro) to excite users' interest to learn from the easiest contents before doing the low difficulty level of assessment. After passing the low level of readings, videos and assessments, users may go to the next levels. Under this phase, selection of the reading materials and videos was carried out carefully, based on the performance levels.



Figure 2 RBT Year 5 Book

- C. Development: In this phase, the selected ADDIE method and the designed process obtained in previous phase are imposed during the My Green App development. Simple explanation and colorful appearance are priority elements that considered for the reading corner materials. Meanwhile, for the learning videos, cartoon-based, short durations, and interactive animations were the main elements chosen to excite users' participations and engagements.
- D. Implementation: Apps has been created using apk pure source code and created in Android operating system. App can be tested by users.
- E. Evaluation: Sampling evaluation will be tested towards Fifth and Sixth Grades primary students, and also RBT's teachers. Questionnaire also will be used to get the users feedbacks on their experience

using the app and also to assess its usage effectiveness to mastering the renewable energy subject that taught in the primary school.

To ensure proposed app can be successfully developed using apk pure software in Android operating source code, these 5 phases in ADDIE approach was aligned with the setup milestones as shown in Figure 3.

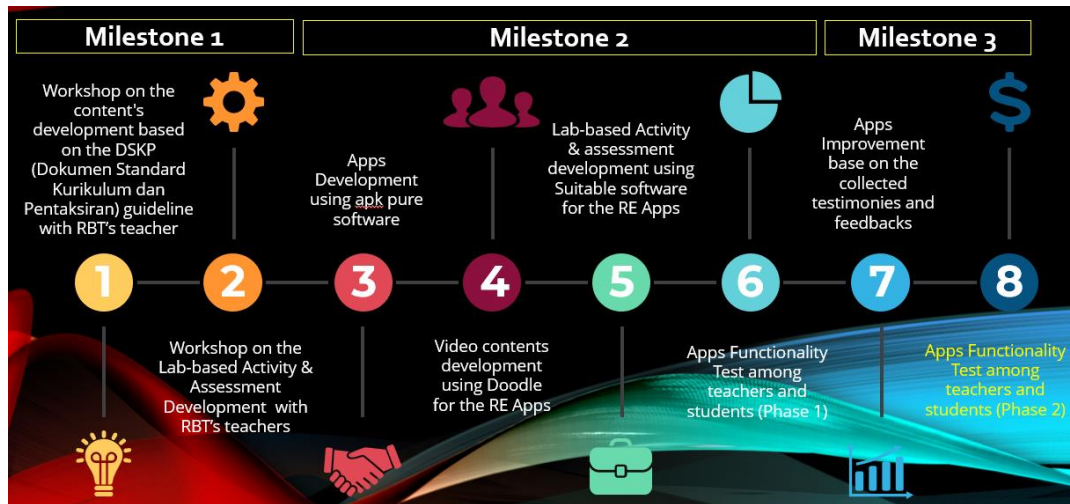


Figure 3 RBT Year 5 Book

Results and discussion

The result for this study / written paper is a form of mobile phone app named as My Green App as depicted in Figure 4(a), which is suitable for Fifth and Sixth Grades primary students in Malaysia educational syllabus. The developed app was developed using apk pure software, and suitable for Android Operating System.





Figure 4 Appearance of My Green App for RBT subject

As can be seen in Figure 4(b) to Figure 4(h) respectively, the app containing learning videos, reading corners, assessment mediums, feedback & inquiry space and also score marks. For the learning videos, reading corners and assessments, contents were designed and arranged under three-degree performance levels; beginner, intermediate and advanced. In this developed app, six types of renewable energy sources have been covered which is solar, wind, hydropower, geothermal, tidal and biomass. To prevent users from losing focus, each video only consumed between 1-2 minutes only. Similar approach also imposed for the reading materials and also the assessment quantity. For each assessment levels, only six questions were asked. To encourage users to monitor their performance achievement, score marks can be recorded in the app and can be viewed for later purpose.

Conclusion

My Green App provides mobile application that enables users to immerse in learning environment anywhere and anytime. On top of that, it helps users to understand the basic principle works of renewable energy sources, that comprising three levels of degree contents and assessments (beginner, intermediate and advanced) that has been integrated in the application. During the functionality testing, this application can perform the activity as expected without any bug and error. Moreover, users can handle the application without any problem as the interfaces are easy to use and learn. As the result from users' evaluation, it is believed that this My Green Apps can inspire and motivate users to learn the renewable energy subjects via mobile phone as long as it has Android Operating System. For the future work, the app's effectiveness towards the fifth and sixth grades primary students can be assessed in the future as by the time this paper was written, the effectiveness on the aforementioned audiences or respondents were not tested yet.

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References

- [1] Sijia Xue, Chuang Wang and Yanchao Yang (2022). Exploring affecting factors of and developing a framework for teachers' online instruction. *Learning and Instruction*, 82: 1-12.
- [2] Mahiswaran Selvanathan, Nur Atikah Mohamed Hussin and Noor Alyani Nor Azazi (2020). Students learning experiences during COVID-19: Work from home period in Malaysian Higher Learning Institutions. *Teaching Public Administration*: 1-10.
- [3] Syerrina Zakaria, Siti Madihah Abdul Malik and Nazihah Safie (2021). Statistical analysis on effects of Covid-19 pandemic on secondary students' performance in mathematics subject. *AIP Conference Proceedings*, 2355(1).

- [4] Elizabeth O. Crawford, Heidi J. Higgins and Jeremy Hilburn (2020). Using a global competence model in an instructional design course before social studies methods: A developmental approach to global teacher education. *The Journal of Social Studies Research*, 44: 367-381.
- [5] Shartini Devi Krishnan and Norlizah C. Hassan (2021). Online Peer Learning amid Covid-19 Pandemic in Malaysian Higher Learning Institution. *Turkish Journal of Computer and Mathematics Education*, 12(14): 1010-1019.
- [6] Patrea Andersen, Stephen Guinea, Kerry-Reid-Searl and Tracy Levett-Jones (2021). Designing Tag Team Patient Safety Simulation: An instructional design approach, *Clinical Simulation in Nursing*, 59: 1-9.
- [7] Aris Apostolopoulos (2021). ADDIE training model: What is it and how to use it in eLearning. Accessed date: 1 August 2022. Retrieved link: <https://www.talentlms.com/blog/addie-training-model-definition-stages/>
- [8] Mat Redhuan Samsudin, Rushana Sulaiman, Tan Tse Guan, Anuar Mohd Yusof, Mohd Firdaus Che Yaacob (2021). Mobile Application Development Trough ADDIE Model. *International Journal of Academic Research in Progressive Education and Development*, 10(2): 1017–1027.
- [9] Andrew DeBell. What is the ADDIE Model of Instructional Design? Accessed date: 1 August 2022. Accessed link: <https://waterbearlearning.com/addie-model-instructional-design/>