Employing ADDIE Instructional Design Model for Educational Digital Game-based Learning

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Abstract

Multiple studies have revealed that the traditional teacher-centred approach where the teacher merely lists words for students to memorise along with their lexical meaning is inadequate. Students often to use the dictionary to find the meaning of new words and recorded in a notebook so that one day it could look them up, learn and memorise them. In order to transform the conventional method into a digital game-based method, educators need tools to ensure that they take a systematic approach when developing learning tools. Using an instructional design model help the educators accomplish the task by giving them a guide to follow to ensure the learning tools meet the needs of the target learners. Therefore, this study explains the ADDIE instructional design model stages for developing an educational digital for language learning.

Keywords: ADDIE, Instructional design, Language learning, Digital game, Digital game-based learning.

Introduction

Digital Game-based learning is an approach that integrates educational content or learning theories into educational games to appeal to the students. The implementation of digital game-based learning builds on the constructive philosophy of learning. Based on constructivist education theory, digital game-based learning attaches educational materials to a computer or video games and is able to be used in almost every subject and competence level. Several scholars, including Prensky (2001), and Bober (2010), are ardent supporters of digital game-based learning as a well-established instructional design in higher education courses. While computer and video games are mostly believed to as sheer entertainment, it is crucial to understand that they are also a tremendously powerful learning tool. This offers successful new learning experiences through the digital game that engage students in immersive teaching and allow them to participate in the twenty-first-century globalised, technological society.

Over the years, several scholars have researched and visualised the comparisons between terminologies of gaming and education, such as game-based learning, gamification, and educational games. The use of gamefulness, gameful interaction, and gameful design to encourage students to participate in class activities is referred to as game-based learning (Hartt et al., 2020; Hamzah et al., 2019). Game-based learning has undoubtedly benefited from the growing acceptance of entertainment gaming as a mainstream leisure activity. On the other hand, gamification stresses adding game features to an actual activity that might be uninteresting, repetitive, or boring (Plass et al., 2015).

On the other hand, an educational game is described as a game that is developed and used for teaching and learning purposes (Al-Azawi et al., 2016). In educational games, the element of fun and education can be integrated to increase students' motivation and engagement. Many studies stated that employing game-based learning is better than traditional lecture instruction, producing better learning effects and higher learning motivation (Azman et al., 2018; Siti Nazleen & Zuliana, 2017; Amna et al., 2017; Al-Azawi et al., 2016; Hamizul & Nik Mohd Rahimi, 2015). As all approaches promote learning in a more or less game-based manner, the use of the terms "game-based learning", "gamification", and

"educational game" interchangeably to refer to this intention. As a result, the table below summarises game-based learning, gamification, and educational games for more explanation (Al-Azawi et al., 2016).

Table 1 *Comparison Between Game-Based Learning, Gamification, and Educational Game*

Comparison Point	Game-Based Learning	Gamification	Educational Game
Concept	Use of games to enhance the learning experience	Gamification is the idea of adding game elements to a non-game situation	The educational game is designed to help students for learning purposes
Objective	To achieve in the game motivate students	Learn motivation from game	For teaching purpose
Content	Usually morphed to fit the story and scenes of the game	Features are added to the LMS or other system	A structured, competitive activity, game played within a context of a story or a created history
Challenge	Challenges that are part of the game must be solved	Looking for a new way to approach the challenge	Maybe exist or not
Character	Character situation	Player avatar weak story	Narrative
Techniques	1. Motivation 2. Relevant practice 3. Specific timely 4. Story, emotional 5. Game goal, challenge	1.Progressing to different levels 2. Scores 3. Avatars 4. Virtual currencies 5. Competition with friends	1. Learning 2. Problem solving 3. Adaptation 4. Interaction 5. Enjoyment and pleasure
Benefits	1. Increases a student memory capacity 2. Computer simulation fluency 3. Helps with fast strategic thinking and problem solving 4. Develop hand-eye coordination	1. Better learning experience 2. Better learning environment 3. Instant feedback 4. Prompting behavioural change 5. Can be applied for most learning needs	1. Motor skills 2. Social development 3. Focus and memory 4. Self-esteem 5. Creativity
Reward	1. Intrinsically rewards 2. Losing may or may not because the aim is to motivate people to take action and learn.	Earn experience points and level up	Scoring point
Level	Hard	Easier	All level

Based on the comparison above, digital game-based learning can be referred to as a new model of electronic learning (e-learning), which possess great potential in the educational process. It may also be extended to classroom lecturing as an alternative learning exercise. Game-based learning aims to showcase new methods in learning practices and provide opportunities for learners to acquire skills and abilities. Digital game-based learning experiences will be described, according to Bober (2010), as being based on activities that have a digital game at their base, either as the main activity

or as motivation for other related matters. It also describes events in a formal classroom or informal learning atmosphere and has learned as an intended or unintentional result.

Game-based learning is also a method of gameplay that has determined the learning outcomes and has been adopted in the traditional classroom in order to practice active learning process, active problem solving, enhance understanding, increase motivation, sustain engagement and improve student achievement (Amna et al., 2017; Fu, 2017; Khaleel et al., 2016; Ugyen et al., 2015; Wilfried et al., 2014). Digital game-based learning integrates digital games in educational tasks that focus on achieving given educational content objectives. This phenomenon has to turn out to be prevalent in educational, technological studies (Fu, 2017; Kim et al., 2009).

According to Prensky (2001), digital game-based learning translates to the use of the creative power of computer games to fulfil a role in education. Digital game-based learning has also been described as a method in which students participate in a rule-defined artificial conflict that ends in a quantifiable outcome (Salen & Zimmerman, 2004). Whereas Juul (2003) describes the digital games as a rule-based system with a predetermined and measurable outcome, where different results are given different values, the player tries to influence the outcome, the player feels bound to the final result, and discretionary and negotiable are the effects of the activity.

Digital game-based learning can be used as an educational form of edutainment or entertainment. It applies to the use of media such as television as entertainment to support educational purposes. It can also be known as an e-learning subcategory where the learning resources are distributed electronically to distant learners via a computer network (Daud et al., 2020; Zhang et al., 2010). Digital game-based learning may also be considered a subcategory of serious game, which is a broader term that has implications outside the field of education, such as games for health, where game-based learning without the qualifier 'digital' is also a broader term and can also refer to learning by means of board games.

The digital game may be considered as an appropriate and efficient medium for learning. That is because it has some characteristics and features that can favourably affect the motivation of the learner to start and continue in the engagement of the learning. Digital game-based learning has been used in a number of tasks and practices and in participation and motivation in learning for decades (Cojocariu & Boghian, 2014). Digital game-based learning ties the instructional process to emerging digital technology to facilitate cognitive improvement and provide children with interactive content and a fun atmosphere (Cojocariu & Boghian, 2014; Erhel & Jamet, 2013; Belloti et al., 2013).

Issues in Vocabulary Acquisition

Vocabulary acquisition is one of the most challenging tasks for students, and a majority of Malaysian students do not reach a satisfactory level of vocabulary acquisition in Arabic. Several studies like Saifuddin (2002), Zawawi, Mohd Suki and Abd Raof (2004) and Rahim (2009), measured students' mastery of vocabulary and found that they have limited vocabulary. Moreover, students have low confidence to use Arabic in class and in their everyday conversations (Abdul Ghani et al., 2022; Zainur Rijal et al., 2016; Abdul Razif et al., 2016; Siti Aisyah & Zamri, 2016; Nadwah & Nadhilah, 2014). This shows that students have limited vocabulary despite learning the Arabic language in primary and secondary school. Hence, teaching Arabic language subjects has yet to establish a satisfying result (Wan Abdul Hayyi et al., 2012). Based on Abdul Razif and Mohd Zaki (2017), Alobaydi et al. (2017), Nadwah and Nadhilah (2014), Gan (2012), Nyikos and Fan (2007), it could be argued that the lack of vocabulary has contributed to students' ability to achieve high Arabic language proficiency. This has also hindered students from becoming good Arabic speakers (Nadwah & Nadhilah, 2014; Nik Murshidah et al., 2014) and demonstrating proficiency in other language skills, particularly in writing (Norhayati et al., 2017).

Previous studies have revealed that most Arabic language teachers still use a traditional teacher-centred approach. The teacher merely lists words for students to memorise and find the meaning of words using a dictionary (Norman, 1988; Rosni, 2017). In some classes, students are only merely copying down the meaning of new words in their notebooks (Schmitt, 2000). The words in this list will then be memorised for future use (Muhammad Sabri, 2011). Students are only exposed to the prescribed vocabulary that they learned in class. The practise of rote learning forces students to remember the vocabulary, rather than understanding the meaning of the words and how to use it in context (Mohd Yusri et al., 2016; Maimun Aqsha, 2009). Such practice is considered as the major hindrance to students' development of Arab language proficiency and the mastery of Arabic language skills (Daud et al., 2021b; Daud et al, 2018; Norhayati et al., 2017; Siti

Aisyah & Zamri, 2016; Rahimi et al., 2014; Nadwah & Nadhilah et al., 2014). Furthermore, Sumaiyah et al. (2018) argued that students have negative perceptions of learning Arabic and are always reliant on their friends and teacher. They are also demotivated to do any self-learning such as revision, reinforcement and exercise to increase Arabic vocabulary (Zaid Arafat et al., 2016).

A more interactive and engaging learning strategy should be implemented to encourage students to learn Arabic vocabulary (Wu, 2018; Irma Martiny et al., 2016; Zaid Arafat et al., 2016), as well as to encourage them to learn independently and actively using electronic materials available to them (Rosni, 2017). The digital game-based learning approach is the most suitable for language learning (Noor Azli et al., 2019; Amna et al., 2017; Fu, 2017; Khaleel et al., 2016; Muhammad Sabri, 2011; Hamizul & Nik Mohd Rahimi, 2015; Prensky, 2001) as it benefits the students by improving their attitude towards learning, enhance motivation and improves their achievement (Hamadallah et al., 2019; Azman et al., 2018; Siti Nazleen & Zuliana, 2017; Amna et al., 2017; Hamzul & Nik Mohd Rahimi, 2015). Moreover, the inclusion of digital games and the various multimedia elements could help students memorise the meanings and pronunciation of new foreign words (Kalyuga et al., 2013; Agca et al., 2013). These elements will enrich the students' learning experience and provide more meaningful listening and pronunciation practices (Ramlan, 2016). Therefore, this study aims to describe the development of educational digital game applications briefly through ADDIE instructional design model approach. The primary role of the educational digital game is to assist the student in learning Arabic vocabulary in a fun and active environment at the tertiary level.

Overview of ADDIE Instructional Design

Instructional design is described as "the comprehensive creation of instructional requirements using learning and instructional theories to ensure instructional consistency". To meet those needs, it is the method of evaluating learning needs and goals and designing a delivery system. It also involves producing educational materials and events, assessing and reviewing all aspects in teaching and learning. Gagne and Briggs (1974) observed that instructional design learning improves by integrating different strategies into the courseware, such as structuring, arranging, and organising information in particular ways, based on the intended learning effect. Furthermore, Reiser and Dempsey (2002) described instructional design as a system of protocols for the consistent and reliable implementation of education and training programmes. Using standardised design methods relative to other planning instruction strategies, the guidance will be more accurate, appropriate and dependable. The approach to the program involves an overview of how its elements communicate and requires synchronisation of all activities. According to Smith and Ragan (2005), instructional design is the whole process: from identifying learning requirements and priorities, through the creation of teaching materials and events, to the assessment of all teaching and learning activities.

A model of instructional design provides a procedural framework for systematic instruction generation. This combines basic elements of the instructional design process, including the expected target interpretation, objective and goal selection. It may also be used in different contexts. This prescribes how the mixture of components of instructional techniques merged into one another to create an instructional course (Braxton et al., 1995). The success of any paradigm depends heavily on the context in which it is being applied; instructional design techniques are situational and not standardised. According to Morrison, instructional design templates provided by Morrison et al. (2007) offer a comprehensive guide to implement the instructional design process for a particular educational campaign. A variety of instructional concept models have been produced since the 1950s. These comprise the ADDIE model, ASSURE model, Dick, Carey and Carey model, Gagne and Briggs model, Hannifen and Peck model, Knirk and Gustafson model, Jerrold Kemp model, and Gerlach and Ely model (Soto, 2013).

Based on the instructional design models, ADDIE was adapted for this current study to develop the educational digital game prototype and as a framework for the whole game development process. The acronym ADDIE stands for five stages, reflecting a diverse and versatile framework to develop successful preparation and performance support systems. The five phases namely Analyse, Design, Develop, Implement and Evaluate. The creation of products using an ADDIE method remains one of the most efficient methods today since it is essentially a mechanism that serves as a leading structure for complicated scenarios and is ideal for producing educational materials and other learning resources (Robert, 2009).

Most educators and instructional developers tend to apply ADDIE's instructional design approach as a framework (Soto, 2013; Budoya et al., 2019) since it offers standardised phases (Chen, 2016) and include guidance for the creation and production of instructions (Ohimain, & Izah, 2015; Ibrahim, 2015). Furthermore, the ADDIE model has specific phases that enable the design, creation, and growth of many high-standard courses (Dick, Carey, & Carey, 2014). The ADDIE model can be adjusted flexibly as the criteria for the course are being fulfilled. To ensure the model more flexibly, the following approaches are essential to be implemented: thinking non-linear by considering various steps that can be applied in parallel, making the best use of each outcome, and preserving flexibility in creating the innovative learning product. The ADDIE model's versatility facilitates evaluation at every level and supports formative review and reconstruction at every stage. This will allow the designers to ensure their systems are more adaptable to various conditions and problems (Morrison et al., 2007).

The ADDIE model combines the students' needs evaluation, design and production of training materials. Additionally, and more importantly, a training program assessment can be carried out using methods that produce observable and specific results (Ghani & Daud 2018; Branch, 2010). ADDIE's instructional design model offers instructors the framework and versatility to achieve their identified goals and objectives for the course creation and execution. The organisers would then be able to offer the most efficient and best student-qualified experience possible. Educators must thoroughly consider the most appropriate condition needed to deliver the training through a fair and impartial view.

The ADDIE model offers a cyclic instructional design system where the results of each phase assessment will take the instructional designer back to the previous step. All the phases are interconnected through the evaluation phase, whereby each phase has an ongoing assessment (Karmila et al., 2019; Ghani & Daud, 2018) and plays an essential position based on the assessment stage obtained (Jasa et al., 2018). Such assessments are known as formative assessments. With the formative appraisal in each step, educators and instructional developers are willing to go back to improvements and amendments before implementing the next stage. One final process product is the beginning point of the next step. At the end of the ADDIE model, it proposes summative assessment to evaluate the whole product (Ghani & Daud, 2018; Okon, 2016).

The aim of the evaluation process, either formative or summative, is to improve the system rather than simply ratify an established way of understanding or current way of doing things (Robert, 2009). Any ADDIE process will be implemented, permeated, and concluded by the assessment system to have sufficient opportunities to participate during the process to enhance the product and the method. Any changes to the proposed instruction will be maintained by collecting analytical data during the formative evaluation, thereby increasing the legitimacy of the entire process.

Development Educational Digital Game for Arabic Language Learning

Analysis

The first phase of which Analysis phase is to gather more data regarding the target respondents' understanding, abilities, or attitude to achieve what needs to be taught to achieve the learning (Lawrence, 2016). During this stage, educators will pinpoint the students' instructional problem, instructional goals, educational environment, and current skillsets (Dick, Carey, & Carey, 2014). There are a few strategies for collecting the information during the analysis process, including focus groups (Zundel et al., 2015; Stockley et al., 2014), one-to-one interviews, distributing questionnaires or surveys (Ghani & Daud, 2018; Ahn et al., 2016; Kondo & Swerdlow, 2013), expert consensus (Dinh et al., 2016), mixed qualitative-quantitative studies and others. Through one of these methods, educators should perform several analyses (Lawrence, 2016) before running the programme or intervention, divided into a needs analysis, task analysis, learner analysis, and performance analysis.

First and foremost, the need analysis should be carried out to decide if the participants really need the specific skill or knowledge. Second, the educators must carry out an overview of task analysis. Here, the activities that the students must undertake are described and divided into parts and expertise, skills, and attitude that they require. This will, in turn, notify the educational objectives later on. Next is an analysis of the learners. Educators will set the current knowledge and skills of the respondent, their desire to learn the subject and their enthusiasm for learning it. The last is performance analysis. The performance analysis is to choose strategies that will provide the data on whether the course of education fulfils the objectives specified. These analyses are emphasising on the participants in focus.

In this case, this study distributed a set of need analysis questionnaires that consisted of several constructs prior to the development of the educational digital game. Arabic students were chosen using random sampling technique to be a respondent for this study. In order to meet students, need, several constructs were employed, such as student's problems in learning the Arabic language, the relevancy of digital games in Arabic class, elements to be included in the digital game and type of digital game preference. Besides, this study also conducted a semi-structured interview among educators to explore the readiness among educators; the elements need to be included such as related theories and approaches, the educational aspects such as pedagogy, test, assessment and content. The data collected will be used in the design phase.

Design

Design is the second phase. The design phase began with instructors applying the findings from the analysis phase to create an overarching structure for delivering the lessons (Lawrence, 2016). This includes determining the instructional process, learning objectives, assessment methodologies, preparing and testing, developing material, collaborating with exam and subject matter experts, and determining the media type, length, and response (Shelton & Saltsman, 2006). The following stage is to create a storyboard for the idea and a prototype. It is critical to be explicit and systematic during the design phase in order to build a logical approach and recognise and assess techniques for accomplishing the goal. Educators must focus on certain components and execute them precisely. Educators must create strategies for graphic and technology design, implement educational policies based on anticipated behavioural consequences, create the user interface and experience, and improve the visual appearance (Daud et al., 2021a; Bamrara, 2018).

In this case, the need analysis data were used to design the educational digital game. First, this study designed and stated the learning objectives and outcome. The objectives and outcome of each game must be parallel to the course. Then, after the objectives and outcomes were decided, this study proceeds to design the learning content and select the resources. Resources for formal learning must consider several factors: language development, reading, and a comprehensive educator guide. The contents are not restricted to primary resources such as a textbook. It can be expended to secondary resources which is useful and reliable such as reference book, website, dictionary and others. The additional resources help educators distinguish curriculum and involve students who need enrichment beyond the core material in the classroom.

Next, this study proceeds to design the learning tool. As suggested by works of literature and experts in a semi-structured interview, a digital game has been adopted as a learning tool as it has a potential significant platform in language teaching and learning. Since this study adopted a digital game as a learning tool, there is a crucial need to employ digital game principles to ensure that the digital game is well developed and suitable for teaching and learning purposes. This study adopted digital game-based learning principles from Bober (2010), highlighting five principles: goal, challenge, feedback, fantasy, and sensory stimuli. In order to sustain student's motivation, this study also employed ARCS motivational design in the educational digital game. Then, this study started to design the flow chart of the game and storyboard of the digital game. The main purpose of a storyboard is to get an overview of the digital game prior to the development process. The educators can design the digital game environment, set up the information and features, and others.

Development

The third phase is Development. The development involves creating and organisation of the actual learning material to be used in the supervision (Lawrence, 2016). The instructor uses all the design process data to create and install the planned curriculum materials (Morrison et al., 2007) and then coordinate and implement multiple development modes. Next, different tests are performed to detect mistakes and enhance operation. The suggestions received may be used to evaluate and update the course as per expectations (Davis, 2013). The educators will carry out an imperative pilot test once the curriculum content has been created. This can be achieved with the participation of the intended participant and the practising of the course content. The suggestions from the pilot would also be helpful in finding the shortcomings and further improving the entire process before the actual execution (Davis, 2013).

In this study, software and hardware need to be used in developing the educational digital game, such as Framework7, jQuery UI, Adobe Photoshop, Audacity, and snipping tool. In addition, in the development process of the digital game, it also needs a smartphone, laptop, USB microphone and hard disc. Apart from software and hardware, the element of visible interaction and invisible interaction were taking into account. The visible interaction is to make it easier for players

to interact with the game, while invisible interactions are game interface layouts that include a consistent set of icon buttons.

Implementation

The following stage is implementation. After rigorous investigation, planning, and preparation, the lesson must be applied or delivered. At this time, all components and methods are translated to practise. This method entails educating trainers, coordinating learners, and arranging an environment conducive to learning (Morrison et al., 2007). It is suggested that you use a classroom instructional design model, such as the Gerlach and Ely model, to assure the effectiveness of information delivery. Preparing instructors prior to the start of the session will aid in their comprehension and familiarity of the subject contents. Learners must have access to necessary resources, equipment, and knowledge in order to perform more efficiently on learning tasks. To ensure that students' knowledge and skill sets are enhanced, they should be familiar with the information presented in the course. Coordination of the learning environment enables the provision of courses devoid of obstacles (Branch, 2010). In this situation, implementation occurs to confirm that all features work properly prior to materials being given to target participants. The development method included several steps, including installation, prototype validation, and testing with target participants.

Evaluation

Evaluation is the final process. Each phase should be reviewed by educators to ensure that the instructional design and content satisfy the objectives. There are two distinct types of evaluation: formative and summative. Formative assessment is an internal evaluation process that occurs at each level of the ADDIE instructional design model in order to examine the team's continuous development and to review the ongoing process (Karmila et al., 2019; Jasa et al., 2018). Whereas summative assessment comes following the application process. Because the emphasis is on the learning outcome, the summative assessment enables a clear comprehension of the concept's true meaning. Summative assessment entails assessments that evaluate domain-specific reference items, instructional course objectives, and student input. Summative assessment is beneficial for gaining a better grasp of the student's performance and the utility of the design features after the course's conclusion (Dick, Carey & Carey, 2014). The picture below depicts the ADDIE instructional design model's flow. The purpose of this study was to examine the efficacy of digital games in teaching the Arabic language and to assess student achievement and motivation using a quasi-experimental methodology.

The ADDIE Model is an iterative instructional design process, where the outcomes of each phase's formative evaluation will take the instructional designer back to any prior step.

One process final product is the beginning product of the next phase.
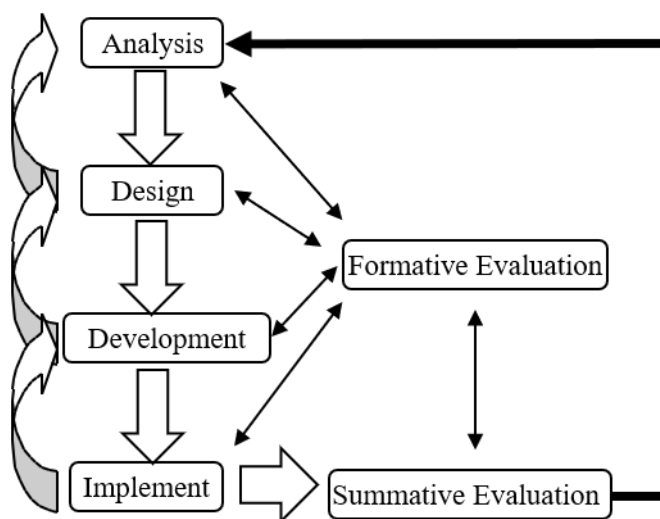
Figure 1: ADDIE Model

Conclusion

The ADDIE model is used to develop an instructional tool for Arabic language learning in this conceptual paper. An excellent tool must be well-structured and include relevant and exciting learning materials. One method to accomplish

successful teaching and learning process is to employ the ADDIE instructional model provided in this paper. Every element of the ADDIE model is meticulously followed in the development of educational digital games in order to provide an effective and efficient instructional tool for language learning that may positively affect students' academic success and motivation. The application of the ADDIE instructional design model in the development of e-learning courses is the study's theoretical contribution. Every stage and method is described in total, and future researchers can adopt them.

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