Need Analysis of Game-Based Arabic Language Learning for Dyslexic Children - A Systematic Literature Review

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Abstract. Game-Based Language Learning has led an environment in which made gaming an authoritative educational tool to maintain engagement and motivation in learners according to that took part in the researchers' recognition in the 21st-century educational system. Although previous research has addressed different applications of learning analytics in Arabic language learning, few studies have investigated the needs of individuals with disabilities. The purpose of this systematic literature review is to explore the need analysis for dyslexic children in game-based Arabic language learning. The methodology used in this paper is adapted from Kitchenham (2004). Based on a systematic process, we reported and discussed our findings with possible future research directions. The results of this study will help to address the issue more appropriately and plan for better training programs in Educational Games for Dyslexic Children.

Keywords: Need analysis, Game-Based Arabic Language Learning for Dyslexic Children, Game-Based Learning, Dyslexia Language Learning

INTRODUCTION

Game-Based Language Learning has led to an environment in which made gaming an authoritative educational tool to maintain engagement and motivation in learners according to that took part in the researchers' recognition in the 21st-century educational system. Proper technique and teaching in the educational system can produce excellent students with abounding skills. So & Seo (2018), in a study on 'A Systematic Literature Review of Game-Based Learning and Gamification Research in Asia' stated that characteristics and principles of good gameplay design are influenced by game-based learning in order to essentially motivate and engage users in education.

Language is the fundamental of culture that encompasses the development of ideas, characters, and human reason. The Arabic language, on the other hand, is not only an element of culture but also the core of Islamic culture and civilisation itself. In fact, it is the heart and source of Islamic teachings because the Qur'an was revealed in Arabic (Yusoff & Adnan, 2008). According to Putri (2017), the Arabic language learning scope includes; linguistic elements, language skills, and cultural aspects. She also stated that the linguistic element itself consists of grammar (qawâ'idu al-lughah), vocabulary (mufradât), pronunciation, and spelling (ashwât 'arabiyyah).

According to D'souza from a study by Anoual & Lakhouaja (2018), learning disabilities (LD) are neurologically-based processing problems reflected as a complication in learning or gaining information that also involves acquiring basic skills such as reading, writing, math, and reasoning, listening, and speaking. They also stated that learning disabilities such as dyslexia, dysgraphia, and dyscalculia are usually exposed since the early stages of schooling. However, it should not be treated as a physical disorder, in which they are simply learning and gaining skills in a different way.

This paper contributes to recent research on the issues and problems in game-based Arabic language learning for dyslexic children by providing evidence on recent past research. Importantly, this study investigates and examines carefully past research using the systematic literature review as recommended by Kitchenham (2007). This study highlights significant gaps in current research targeted at game-based learning, Arabic language and dyslexia. Few studies have been addressed or investigated and appropriately evaluated in game-based learning in for the Arabic language focusing on dyslexic students.

The remainder of this paper is structured as follows: Section 2 presents the background on dyslexia and Arabic language learning. Section 3 describes the methodology used in this study. Section 4 and 5 presents the process of achieving the data and findings. Finally, section 6 concludes the paper and points for further research.

ARABIC LANGUAGE LEARNING FOR DYSLEXIA

Language is an element of culture that encompasses the result of human thought, character and intellect. The Arabic language is not only an element of culture but also the core of Islamic culture and civilization itself. In fact, it is the pulse and source of Islamic teaching because the Qur'an was revealed in Arabic (Ibrahim et al., 2017). Language learning for children with dyslexia is already known to be a challenge which makes it agonising for second language learning. There is little research on the topic of Arabic language learning for dyslexic children, especially in Malaysia. Based on recent research,

there are few learning aids for Dyslexics in Arabic learning (Aljojo et al., 2018; Anoual & Lakhouaja, 2018; Haladjian et al., 2013).

In consonance with Yazin & Yin (2015), Dyslexia is not a pathological or permanent sickness; rather, it is an internal condition that happens in a person and limits the development of learning skills. Dyslexia is a condition that affects 5% to 12% of youngsters and is defined as an unexplained difficulty reading words or fluency in reading and writing (Norton et al., 2015). It is necessary to determine the key linguistic aspects in order to identify and understand dyslexia in a certain language (Elbeheri et al., 2006). As a result, it is vital to research and identify the unique characteristics of Arabic and its culture.

Al Rowais et al. (2013) define Arabic linguistic features as Arabic written in an alphabetic system with 28 letters representing 34 phonemes. The usage of symbols such as a full stop for abbreviations and acronyms is uncommon in Arabic (Al Rowais et al., 2013). Furthermore, Arabic language does not have any upper and lower cases. They also stated that Arabic letters are also called bidirectional because the script is read and written from right to left, whereas numerals are read and written from left to right.

METHODOLOGY

This study employs resources from the previous literature review as well as internet sources to perform as recommended by Kitchenham (Kitchenham, 2004) and Keele (Keele, 2007). Using an unbiased search technique, a systematic literature review is required to locate as many primary papers as feasible that relate to the study objectives (Masrop et al., 2019). According to Keele, systematic reviews provide proof that the phenomenon is strong and transferable if research produces consistent results. If the results of the investigations are inconsistent, the sources of variation might be investigated. The systematic review has three main phases, which are planning, conducting and reporting the review (Kitchenham et al., 2009, 2010; Kitchenham & Charters, 2007). The steps and details in the systematic literature review method are documented below.

PLANNING

For this phase, it is required to identify the need for a review and the development of a review protocol. The research question is defined for this stage.

Research Questions

The main objective of the systematic literature review is to fully understand the need for analysis of game-based Arabic language for Dyslexic children. Hence, the research question the researcher addressed for this literature review is: What are the issues and problems for game-based Arabic language learning among dyslexic children.

CONDUCTING THE REVIEW

This stage consists of the identification of research, study selection, quality assessment, data extraction, and data synthesis. This section will go over each of these stages. Although certain phases must be completed in order, others can be completed at the same time.

Identification of Research

Search Strategy

The articles collected will be filtered and categorized manually by the researcher for the needed data. The data are categorized as follows:

TABLE (1). Article Search Strategy

Category	Description
Research ID	ID number is placed in each selected study to simplify the process of the screening and filtering of information
Author	The author's name
Year	The year the articles were published
Main Findings	The main findings summary of the article

Research Keywords

The papers were investigated from the search engines by searching for the publications that match with the logical words. Search strings are also constructed using Boolean ANDs and ORs (Kitchenham & Charters, 2007). For this study, the terms used are; (issues OR struggles OR challenges OR problems) (game-based language learning OR game-based learning) (Arabic language OR second language) (Dyslexia OR learning disability OR children), and (learning OR teaching OR education).

Database

The primary search was Google Scholar, which included well-known online databases containing scientific publications and journals, conference proceedings, and technical papers which included a complete analysis of references and citations.

Study Selection

Study Selection Process

After determining the keywords and search string, the articles searching and reviewing process were conducted through the Google Scholar database. Google Scholar includes well-known online databases containing scientific publications and journals, conference proceedings, and technical papers, and the secondary search was Google search engine, which included a complete analysis of references and citations. The papers were investigated from the search engines from 2017 to 2022 by searching for publications that match with the logical words mentioned previously. The search terms were applied to the papers' titles, abstracts, and keywords.

The irrelevant studies were subsequently eliminated through manual abstract assessment. The studies were then further eliminated after being analysed based on inclusion and exclusion criteria. Then, the duplicates were deleted from the research. Finally, the remaining research will go through the elimination process after skimming through the full papers. The search strategy is summarized in Table 2.

TABLE (2). The Search Procedure and Number of Papers Included in the Review

Step	Description
Step 1	Search for the databases for the keywords in titles, abstracts and keywords
Step 2	Inclusion and exclusion criteria application
Step 3	Full paper skimming
Step 4	Elimination process

Step 1: All the papers that contain keywords in their titles and/or abstracts and/or keywords were included. Several reputable digital databases were used as data sources.

Step 2: The papers are then analysed based on the inclusion and exclusion criteria (refer to 5.2.2 Inclusion and Exclusion Criteria)

Step 3: The abstract and full paper are skimmed and reviewed manually according to the relevance of this study.

Step 4: After manually evaluating the remaining studies, it was discovered that a number of them were irrelevant, therefore they were removed. The elimination process is based on these characteristics: The abbreviated version of studies that were already in the review as another study; Studies that do not offer any open-source full paper; Studies that are irrelevant to the research question or study.

The outline of the findings is given in Table 3 shows the qualitative results obtained after each phase. Digital databases were used to compile the research.

TABLE (3). Papers Retrieved for Each Step

Step	Result
Step 1	5,740
Step 2	20
Step 3	8
Step 4	5

All the papers are summarized in Table 4 below.

TABLE (4). Details of the Papers Retrieved

ID	Title	Author
S1	Exploring the Use of the ICT in Supporting Dyslexic Students' Preferred Learning Styles: A Preliminary Evaluation	(Benmarrakchi et al., 2017)
S2	Usability Features for Arabic Assistive Technology for Dyslexia	(Aldabaybah & Jusoh, 2018)
S3	Computer-Assisted Learning Language for Learning Disabilities in The Arabic Language: Diagnosis, Training and Assistance	(El Kah, 2019)
S4	Digital Games Based Language Learning for Arabic Literacy Remedial	(Masrop et al., 2019)
S5	Adapting E-Learning to Dyslexia Type: An Experimental Study to Evaluate Learning Gain and Perceived Usability	(Alghabban & Hendley, 2020)

Inclusion and Exclusion Criteria

The articles were sampled according to the identified inclusion and exclusion criteria.

The inclusion criteria are:

1. Studies that include any of the keywords or logical words as stated beforehand (refer to 5.1.2).
2. Papers that are published between 2017 to 2022

3. Studies that include anything related to Arabic or language learning for dyslexia children
4. Game-based language learning for Dyslexia children or game-based Arabic language learning for Dyslexia (Arabic or second language learning)

The exclusion criteria are:

1. Articles without language learning OR Dyslexia children
2. Papers that are not related to educational games for dyslexic children in language learning
3. Papers that do not mention any issues or struggles or challenges or problems in game-based language learning for dyslexic children
4. Studies that are closed-source with limited information
5. Published before 2017

Quality Assessment

Each SLR was evaluated using the criteria that are based on four quality assessment (QA) questions as recommended by Kitchenham and Charters (2007, 2009). The questions are as follows:

QA1: Is it likely that the literature search yielded all relevant studies?
QA2: Are the evaluation of the quality and validity of the studies dependable?
QA3. Were the basic data and studies competently described?
QA4: Do the findings achieve the research objective?

The questions were scored and defined as shown in Table 5 below.

TABLE (5). Details of the Quality Assessment Questions

Scoring Question	**Yes (Y) = 1**	**Partly (P) = 0.5**	**No (N)/Unknown = 0**
QA1	The writers have either searched four or more digital libraries and used additional search algorithms, or they have recognised and cited all journals on the subject.	The authors searched three or four digital libraries without using any additional search algorithms, or they searched a limited range of articles and conference proceedings.	The authors obtained up to two digital libraries or a very limited collection of journals.
QA2	Quality criteria were stated explicitly by the authors and retrieved from each primary study.	The study addresses quality issues as part of the research question.	There has been no attempt to assess the quality of individual primary studies explicitly.
QA3	Each study's information is displayed.	Only a summary of data from primary studies is provided.	The outcomes of the many primary studies are not disclosed.
QA4	The findings answer the research objective stated clearly in the study	The findings are inherent to the research objective	The findings aren't specified and can't be inferred easily

The scoring procedure was Y = 1, P = 0.5, N/Unknown = 0 as (Kitchenham et al., 2009). The highest score will demonstrate the quality of the articles and answer the research questions.

TABLE (6). Scoring Scale by Kitchenham et al. (2009)

Scoring	
Yes	1
No/Unknown	0
Partly	0.5

The quality assessment for each study was calculated based on the questions. The average quality scores for studies each year is shown in Table 7.

TABLE (7). Scores for Each Selected Paper

ID	Title	Author	Q1	Q2	Q3	Q4	Total Score
S1	Exploring the Use of the ICT in Supporting Dyslexic Students' Preferred Learning Styles: A Preliminary Evaluation	(Benmarrakchi et al., 2017)	1	1	1	0.5	3.5
S2	Usability Features for Arabic Assistive Technology for Dyslexia	(Aldabaybah & Jusoh, 2018)	1	1	1	1	4
S3	Computer-Assisted Learning Language for Learning Disabilities in The Arabic Language: Diagnosis, Training and Assistance	(El Kah, 2019)	1	1	1	1	4
S4	Digital Games Based Language Learning for Arabic Literacy Remedial	(Masrop et al., 2019)	1	1	0.5	0.5	3
S5	Adapting E-Learning to Dyslexia Type: An Experimental Study to Evaluate Learning Gain and Perceived Usability	(Alghabban & Hendley, 2020)	1	0.5	1	0.5	3

Table 7 shows all the papers retrieved reached a total score of above 3. Hence, all the articles that scored 2 or more on the quality scale are deemed to be good quality (Kitchenham et al., 2010). Articles S2 and S3 scored the highest at 4 which is the full score of the assessment. Meanwhile article S1 scored 3.5 which is the second-highest scoring among the others. Scoring at the lowest, article S4 and S5 scored at 3. All 4 articles passed the quality assessment with higher score than average.

Data Extraction

The data were extracted for both quality and classification data from the articles assessed earlier. The following data, which were obtained in the original study, were also extracted in addition to the quality assessment. The researcher focuses on the issues and problems of game-based Arabic language learning among dyslexic children. The information and data were recorded accordingly as stated previously (refer to 5.1.1 Search Strategy). The issues and problems faced by Dyslexic children in game-based Arabic language learning are summarized in Table 8.

TABLE (8). Summary of Selected Articles

ID	Author(s)	Year	Findings
S1	FatimaEzzahra Benmarrakchi, Jamal El Kafi, Ali Elhore, Sara Haie	2017	Different learning styles among dyslexic students are more likely to be a factor, and dyslexia is seemingly associated with metacognitive processing rather than just a reading difficulty.

S2	Balqees Aldabaybah, Shaidah Jusoh	2018	A set of proper usability features in Arabic assistive learning technology affects the effectiveness of learning among dyslexia students
S3	Anoual El Kah	2019	There are no specific guidelines for dyslexia-friendly texts for any computer-assisted Arabic language learning system.
S4	Noor Azli Mohamed Masrop, Hafawati Ishak, Ghazali Zainuddin, Siti Rosilawati Ramlan, Muhammad Sabri Sahrir, Harwati Hashim	2019	The majority of the existing game-based Arabic language learning is limited only to alphabet content, lacks overall presentation quality and no systematic design process
S5	Weam Gaoud Alghabban, Robert Hendley	2020	Students with dyslexia have distinct types of dyslexia, reading impairments, and hence diverse needs.

Table 8 presents the summary of selected articles retrieved from Google Scholar database. Very few studies related to game-based Arabic language learning for dyslexic children were made along the year 2017 until 2021. One article per year from 2017, 2018 and 2020 each was chosen. Meanwhile, for year 2019, two articles are published and selected for this study. The findings of each article regarding the issues and problems of game-based Arabic language learning for dyslexic children were outlined into inadequate learning styles, jarring elements and guidelines for the learning aid.

Data Synthesis

Dyslexia, like other learning difficulties, is caused by a variety of factors, including medical, inherited, biochemical, environmental such as smoking, and developmental factors (Aldabaybah & Jusoh, 2018). Dyslexia is a specific disorder characterised by severe impairment in reading ability that affects and disrupts a person's language development and functioning (Aldabaybah & Jusoh, 2018; Alghabban & Hendley, 2020; Benmarrakchi et al., 2017; El Kah, 2019).

Several recent studies on dyslexia have been published in different scientific fields. However, only a few research are made on the use of Information and Communication Technology (ICT) to help dyslexic children in Arabic language learning (Benmarrakchi et al., 2017). According to Benmarrakchi et al., students with dyslexia are having difficulties in game-based Arabic language learning due to the difference in learning style respectively. The findings of the questionnaire of the experimental group using VAK learning style shows that dyslexic children with visual preference of (37%), followed by (25%) of both visual-kinesthetic and visual-auditory preference, and (13%) prefers kinesthetic approach. Meanwhile, (0%) of the students prefer auditory and kinesthetic-auditory. There are definite conclusions to be reached based on the findings: the majority of the dyslexic pupils are visual and activist learners. As a result, dyslexia is more than just a reading problem; it's most likely linked to a problem with metacognitive processing. Hence, in consonance with Benmarrakchi et al. (2017), understanding and adopting the appropriate learning style and motivation that fits dyslexic children is the best approach in the development of game-based Arabic learning.

A set of proper usability features in Arabic assistive learning technology affects the effectiveness of learning among dyslexic students. This is shown in the study held by (Aldabaybah & Jusoh, 2018), where dyslexic students are often confused with too many

colours and options on the screen compared to normal students which lead to recognition problems. In terms of graphics, animations, colours, and voice-over, the whole presentation is lacking in quality (Masrop et al., 2019).

There are no specific guidelines for dyslexia-friendly texts for any computer-assisted Arabic language learning system (El Kah, 2019) and no systematic design process (Masrop et al., 2019). Readability is the most important feature in dyslexic learning for one of its complications is in spelling and reading. However, the majority of Arabic language learning games focus on the alphabet alone, not in words nor sentences (Masrop et al., 2019). The lack of dyslexia-focused systematic design approach contributes to the issues and problems faced in dyslexia learning, especially in Arabic language that has a variety of unique characteristics.

Furthermore, students with dyslexia have distinct types of dyslexia, reading impairments, and hence diverse needs. The dyslexia types are; letter identity, Letter Position Dyslexia (LPD), attentional, neglect, visual output. Based on a study by Alghabban and Hendley (2020), it may be deduced that adjusting learning materials to the dyslexia type results in much superior short-term and long-term learning gains than the non-adaptive condition. Dyslexic pupils' requirements and characteristics can also be accommodated by adaptive e-learning systems. Adapting to a student's dyslexia type, learning style, cognitive qualities, past knowledge and experience or behaviour (Alghabban & Hendley, 2020; Benmarrakchi et al., 2017).

Given that numerous characteristics in the Arabic language, such as morphology, phonology, and diglossia, influence both spelling and reading performances, the nature of the Arabic language may slow down young readers' reading speed and lead to reading difficulties (El Kah, 2019). Other than that, El Kah (2019) and Aldabaybah & Jusoh (2018) also stated that cultural variables also play a role in Arabic dyslexia, as colloquial dialects change from nation to country, affecting the formal language used in schools and formal writing in different ways. In regards to reading or spelling words in the Arabic language, several complexities and obstacles arise, such as orthographically similar words and letters.

CONCLUSION AND FUTURE RECOMMENDATION

Although prior findings from previous studies show great achievement and development process in game-based language learning in Arabic for dyslexic children, there are still flaws, issues and problems that need to tackle and improve. Game-based learning is a medium of learning aid that provides motivation, fun and education. It is one of the educational innovations that can be expended in various ways and purposes especially with proper guidelines, framework, system, and proper knowledge in the selected field, which in this study focuses on; game-based learning, Arabic language, and dyslexia. Thus, for this research, it is expected to help future researchers in solving the issues and problems in game-based Arabic language learning for dyslexic children, and in the hope to aid language learning for dyslexic students in general.

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