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A Game-Based Learning Model

Fatmah Mohamed Ali Ramsi

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A GAME-BASED LEARNING MODEL

Fatmah Mohamed Ali Ramsi

This thesis is submitted in partial fulfillment of the requirements for the degree of Master of Science in Software Engineering

Under the Supervision of Professor Boumediene Belkhouche

December 2015
Declaration of Original Work

I, Fatmah Mohamed Ali Ramsi, the undersigned, a graduate student at the United Arab Emirates University (UAEU), and the author of this thesis entitled “A Game-Based Learning Model”, hereby, solemnly declare that this thesis is my own original research work that has been done and prepared by me under the supervision of Professor Boumediene Belkhouche, in the College of Information Technology at UAEU. This work has not previously been presented or published, or formed the basis for the award of any academic degree, diploma or a similar title at this or any other university. Any materials borrowed from other sources (whether published or unpublished) and relied upon or included in my thesis have been properly cited and acknowledged in accordance with appropriate academic conventions. I further declare that there is no potential conflict of interest with respect to the research, data collection, authorship, presentation and/or publication of this thesis.

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Abstract

The purpose of this research is to design a conceptual model and develop an implementation as a proof of concept of game-based learning (GBL) to support linguistic skills acquisition. Our model lays the foundations of game-based learning by defining methods, processes, and procedures to support the development of game-based learning systems. Integration of learning and gameplay raises various issues, among them the learning process, learning content, and game characteristics.

Language competency is fundamental to academic and social success. Vocabulary acquisition is a primary basis for language competency. Word lists and dictionaries have been used as a resource to enrich vocabulary. The general trend in dictionary development is towards the introduction of interactivity and visualization. Not only do they effectively capture the traditional didactic concepts, modern e-dictionaries provide structures and functions that support and encourage learning. To a certain extent, they can be viewed as a scaled down version of game-based learning, in which we see effective alternatives to acquire linguistic skills, specifically in the context of the Arabic language. GBL supports a multi-modal learning environment and various forms of learning strategies, such as exploration, interactivity, and active participation.

A basic issue we are facing is the definition of a model of GBL. To delimit the progress in GBL modeling, we review some existing Arabic games intended for education of children. We found that there are very few games for learning Arabic dedicated to children. We analyzed several games for learning Arabic in terms of the nature and organization of the contents, gameplay, interactivity, graphics and assessment. Generally, they are simplistic and tend to revolve around the same trivial idea. Overall, there is a lack of quality in the presentation in terms of graphics, animation, colors, and voice-over. None of these Arabic games shows a systematic design process. Moreover, to synthesize the dominant features and trends, we conducted a comparison of current dictionaries features in different
languages. We selected some representative English and French dictionaries available on the Web, which provides many features like searching (by image and by category) and finding detailed descriptions. For comparison purposes, an Arabic dictionary was also included. This study was intended to identify possible features that enhance the ease of learning a new language within a GBL context.

**Keywords:** Game-based learning; learning content; learning process; vocabulary acquisition.
عنوان للمؤلف

المؤلف:

العنوان:

الخلاصة: إن هذا البحث يهدف إلى تطوير نموذج أسس التعليم القائم على اللعب من أجل دعم اكتساب المهارات اللغوية و ذلك من خلال تحديد الأساليب والعمليات والإجراءات لدعم تطويره وتنفيذاته في المدارس، إن عملية التعليم باللعب يثير العديد من القضايا من بينها:

- كيفية اختيار المحتوى التعليمي وترتيبه بطريقة متسلسلة ومنهجية، كما تشكل عملية تصميم اللعبة موضوع مهم سنتطرق لناقشته لاحقا.

التعليم هو قيام الفرد نفسه باكتساب الخبرات والمعرفة والمهارات، بينما التعليم هو اكتساب الأخرين الخبرات والمعرفة والمهارات أو ما يسمى التلقين، يعتبر التلقين حاليا وسهل تقليدية قليلة الحدود مقارنة بالتعليم الذي يحفز الفرد على البحث والأكتشاف وتنمية قدراته العقلية والجسدية، إن هذا البحث لا يهدف إلى تحقيق دافعية الطالب للتعلم فقط بل تعرف المتعلم وإثارة دافعينه من خلال دمج التعليم باللعب.

لقد قمنا بدراسة الألعاب العربية المتاحة على الشبكة العنكبوتية وفي الأسواق وتحليلها من حيث المضمون والمحتوى التعليمي وتصميمه، görevنا إلى أن الألعاب العربية بشكل خاص التعليمية منها تحتاج إلى عملية تصميم منهجية وعملية منظمة، كما وجدنا أنها تقتصر إلى الجودة من حيث الرسومات والصور المتحركة والألعاب والألواح والأصوات، إلى جانب ذلك أن عالمنا العربي يفتقر إلى المراجع ذات القيمة والجودة لاستخدامها في عملية التعليم مقارنة بالراجع المتاحة في اللغات الأخرى.

و بما أن اللغة هي أساس نجاح الفرد سواء على المستوى الأكاديمي أو الاجتماعي، فإن
اكتساب المفردات هو المحور الرئيسي للحصول على الكفاءة اللغوية، وبناءً على ذلك استخدمت قوائم الكلمات والقواميس اللغوية كمصدر لإثراء المفردات وتعليم المفاهيم والدلائل اللغوية، حينما التعليم القائم على اللعب يقدم بđائل فعالة للاكتساب المهن للغوية.

إن التعليم القائم على اللعب يشكل بيئة تعليمية متعددة الوسائط فعالة للغاية. كما أنها تقدم أشكالًا مختلفة من استراتيجيات التعليم كالاستكشاف والتفاعل والمشاركة الفعالة. إن النموذج الذي يقدمه هذا البحث عبارة عن عالم مصمم يحتوي بيئة افتراضية شبيهة بالبيئة الحقيقية المحيطة بالتعلم؛ مما يتيح المجال للمتعلم لإجراء وفهم العلاقة بين الخبرات التعليمية في البيئة الافتراضية والبيئة الحقيقية بسهولة. إن وضع التعليم في بيئة ما يثير فضوله للبحث والاكتشاف ويولد لديه الرغبة للتعلم المزيد، قد يكون مثل الصبي القديم القائل: أقلي لوضوء أنمي، أرمي أذكر، أذكرك، سوف أفهم. هو أقرب مثال لما تعرضه التعليم القائم على اللعب.

في التعليم القائم على اللعب بدائل فعالة للاكتساب المهن اللغوية فهي تشكل بيئة تعليمية متعددة الوسائط فعالة للغاية. كما أنها تقدم أشكالًا مختلفة من استراتيجيات التعليم مثل الاستكشاف والتفاعل والمشاركة الفعالة. هذا البحث يهدف إلى تحسين دافعية الطالب للتعلم من خلال دمج التعليم باللعب. فبعد مراجعة الألعاب العربية الموجودة وجدنا أننا تحتاج إلى عملية تصميم منهجية كما أنها تفترض إلى الجهد من حيث الرسومات والصور المتحركة والألوان والأصوات. كما أن العالم العربي يفترض أن مراجعة عربية لاستخدامها فلتعليم مقارنة باللغات الأخرى. إن الغرض من هذا البحث هو تطوير نموذج يضع أسس التعليم القائم على لعبة من خلال تحديد الأساليب والعمليات والإجراءات لدعم تطوير وتغذية لأدوات فعاليته.

مفهوم البحث الرئيسي: التعليم القائم على اللعب؛ المحتوى التعليمي؛ عملية التعليم؛ اكتساب المفردات.
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Firstly, I would like to express my sincere gratitude to my advisor Professor Boumediene Belkhouche for the continuous support of my Master study and related research, for his patience, motivation, and immense knowledge. His guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better advisor and mentor for my Master study. I would also to express my gratitude to the examining committee members, Professor Zakaria Maamar and Dr. Saad Harous. Also, I thank my colleagues for the stimulating discussions, for the sleepless nights we were working together before deadlines, and for all the fun we have had in the last two years. Last but not the least, I would like to thank my family: my parents, my brothers, and my sister for supporting me spiritually throughout writing this thesis and my life in general.
Dedication

To my beloved parents and teachers
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Chapter 1: Introduction

1.1 Problem Definition

Digital natives spend the majority of their time interacting with devices ([21, 7, 34, 18]). They play, communicate, collaborate, and learn while connected. A substantial amount of their knowledge is acquired through surfing and social media. Their preferred and inherent way of learning is through exploration and self-discovery. This process involves the learner and the technology offered by cyberspace, a state referred to as “cyberlearning” [28]. While current educational methods are adopting new technologies, they have not addressed systematically learning processes, infrastructures, curriculum structures and assessment methods to support cyberlearning. Indeed, completely new models of the learning process are needed to integrate technologies and learning sciences, and to effectively utilize the powerful tools for representing, visualizing, manipulating, and interacting with the learning content [8].

1.2 Motivations

The infrastructure and resources offered by Information and Communication Technologies (ICT) are continuously expanding the availability of knowledge and the means to acquire it. The use of ICT through the so-called smart devices, and specifically in learning, permeates all segments of society [7]. ICT-based language learning is one of the technology-based approaches of language learning commonly found in our daily life. As mobile devices become more advanced (e.g., high bandwidth and powerful processing capabilities) their potential and power as learning-based devices offer more possibilities for building educational software. Mobile and wireless technologies can support active learning by providing immediate communication channels and instantaneous access to learning resources. Despite the wide spread of ownership and use of mobile devices, the adoption of learning-driven technologies in the Arabic education process is still lagging. One of the objectives of this research is to address this lag.
Game-based learning, conceived as the integration of games and learning, is being advocated as a major component of cyberlearning ([7, 18]). Several factors, such as interactivity, feedback, and immersion, motivate the use of games for educational purposes. Moreover, game-based learning as a complement to other learning resources has been shown to be highly effective in promoting various cognitive skills ([36, 49, 48]). However, despite these positive results, fundamental research on issues, such as the integration of games and learning, conceptual structuring of the learning content, and learning assessment, are just being recognized. Our motivation is to develop an interactive linguistic skills acquisition environment that supports: Conceptual map, ease of learning and enjoyment. Also, to develop a GBL model to support the Arabic language to make learning a fun activity. The research literature spans many academic and professional fields, thus resulting in a variety of disconnected approaches, each with its particular conceptual basis. A major objective of this research is to investigate these fundamental issues.

1.3 Research Objectives

The main objective of this research is to develop a framework to support the integration of games and learning. To achieve this goal, the following objectives are addressed:

- Assess the state-of-the-art in game-based-learning
- Investigate learning practices in KG
- Develop a model to integrate learning and playing.
- Implement a prototype to demonstrate the feasibility of the model.
- Evaluate the effectiveness of this model.

1.4 Outline of this Thesis

In what follows, we present an introduction to the game-based learning (GBL) and the main motivations behind its adoption. To gain a basic understanding of GBL, we analyze some
educational games and summarize their major characteristics. Based on this analysis, we elaborate a framework that captures the integration of games and learning. To demonstrate the feasibility of our approach, we implement a GBL prototype using game technology. This thesis is structured in the following approach:

In chapter 2, we introduce the game-based learning. First, we discuss the definition of the GBL and the state of video games in general. Then, we explain what learning from game is and describe the main games genres. Moreover, we investigate attributes that make games enjoyable. Finally, we discuss the advantages and disadvantages of game-based learning.

In chapter 3, we evaluate some Arabic educational games and summarize their major characteristics. Also, we overview the state of Arabic dictionaries. Then we describe three kinds of surveys we carried out: (1) Questionnaire for Kindergarten teachers, (2) Visit to Kindergarten, (3) Interviews with Kindergarten teachers. From these surveys, we derive and discuss our findings. We also review the educational system in the United Arab Emirates in some detail and summarize the curriculum content in use. Finally, we analyze the curriculum content model for the kindergarten stage in Arab World and summarize our findings.

In chapter 4, we develop a model to build a game-based learning prototype. We explain our approach to modeling GBL for linguistic skills acquisition and recommend solutions to the major challenges we noted in chapter 2. We identify game-based learning components. Then, we identify the idea and the goal of the model. We describe the main components of our model and explain each in detail. We also describe the structure of the game. A description of our prototype implementation is described. Finally, we evaluate our model and conclude the findings.

In chapter 5, we summarize this thesis and propose some ideas about future research.
Chapter 2: Literature Review

In this chapter, we provide an introduction to game-based learning and the main motivations behind its promotion. We define the meaning the game-based learning in section 2.1. In section 2.2 we highlight motivations underlying game-based learning adoption. Then, we discuss what is learning from games in section 2.3. In section 2.4 we list the types of games. Also, we summarize results of a survey about what makes games enjoyable in section 2.5. We investigate the advantages and disadvantages of game-based learning in sections 2.6 and 2.7. Finally, we summarize the chapter in section 2.8.

2.1 Definition of Game-Based Learning

A definition of GBL requires defining each part separately and then integrating the two definitions. Definition of a game depends on the discipline perspective, i.e., psychology, sociology, literature, education, IT [33]. In general, the traditional definition of game is summarized as: “Any contest (play) among adversaries (players) operating under constraints (rules) for an objective (winning) - to describe a game as a contest fails to address the essence of the activity”[37]. Gameplay constitutes the essence of games and is defined as “the degree and nature of the interactivity that the game includes, i.e., how the player is able to interact with the game-world and how that game-world reacts to the choices the player makes [37]. Game-based learning (GBL) is “an e-Learning platform that can encourage a learner to improve his learning motivation through game playing experience” [44]. GBL can be defined as “the use of a computer game-based approach to deliver, support, and enhance teaching, learning, assessment, and evaluationăǓ[15]. GBL covers applications using the characteristics of video and computer games to create engaging and immersive learning experiences for delivering specified learning goals, events and experiences [24]. Compared to the traditional text based learning, GBL is a more attractive and interesting platform that enables learners to achieve improved learning performance [31]. People need to build educational games that contain material which the students learn in the classroom. Students will learn
more in attractive settings and they will be gaining experience and learning by overcoming challenges in order to achieve a winning state.

2.2 Game-Based Learning Adoption

The reason most kids don’t like school is not that the work is too hard, but that it is utterly boring [30].

If school is described as boring, games are promoted as being fun and attractive. By the time young people reach the age of twenty one, they would have spent playing computers and video games about 10,000 hours [31]. This sheer number is more than sufficient to make them experts in a given field [31]. It also implies that one spends enough time playing games to graduate from college. The abundant availability of computers, smart devices, and games will only increase the playing time. As shown in figure 2.1, about 30% of young people play nearly every day, about 15% play daily and more than 35% play some days [31]. Furthermore, a number of studies were carried out that focused on retention of learning. The result

---

**Figure 2.1: Frequency of Playing Video Games.**

If school is described as boring, games are promoted as being fun and attractive. By the time young people reach the age of twenty one, they would have spent playing computers and video games about 10,000 hours [31]. This sheer number is more than sufficient to make them experts in a given field [31]. It also implies that one spends enough time playing games to graduate from college. The abundant availability of computers, smart devices, and games will only increase the playing time. As shown in figure 2.1, about 30% of young people play nearly every day, about 15% play daily and more than 35% play some days [31]. Furthermore, a number of studies were carried out that focused on retention of learning. The result
was that eight out of eleven studies showed that retention is better when using game-based learning, while the results of the three studies showed no significant difference [30]. Recent meta-analyses confirm that more learning happens while playing games [49, 48, 36]. Regardless of the kind and content of games, players acquire skills, such as flying airplanes, driving fast cars, operating theme parks, being soldiers, building civilization, and practicing a profession [31]. Moreover, effective learning is enhanced when the learner is mentally involved, interacts actively within the game, and faces a balance of challenges and possible courses of action [30]. GBL provides a platform to learn through experience and knowledge acquisition. This combination is often more efficient than learning by just studying. Hence, developing educational games may benefit players in addition to having fun. Besides experience, GBL immerses players in a pleasant and friendly world far away from everyday life. Thus, mentally, players can relax and focus on something different without any pressure. The underlying idea is that students learn better when they are having fun and are engaged in the learning process [30]. Also, game-based learning uses action in addition to explanation so the learners will understand deeply the significance of the facts, how and why [19, 15]. Moreover, game-based learning provides richer experiences for the knowledge-construction process, encourages appreciation of multiple perspectives, embeds learning in realistic and relevant contexts, and triggers self-awareness of the knowledge construction process [30]

2.3 Learning from Games

A recent meta-analysis [48] confirms the positive effects of GBL on learning. Figure 2.2 derived from data in this meta-analysis highlights the impact of GBL. Players learn new skills via games, as afforded by the variety of sophisticated games covering a wide spectrum of themes [45]. As they play, they learn how to acquire and assimilate information from different sources. For example, as basic as it sounds, concepts and relationships can be learned, such as clouds are in the sky and fish lives in the water. While facing challenges, players elaborate strategies, analyze new situations, and make decisions in order to proceed towards the winning goal [13]. Throughout a game, in order to survive and succeed, players
develop quick physical and mental reflexes to react and make decisions in a timely fashion. For example, in chess, the player must have a sound plan to win and very often must make decisions quickly and change the plan [39]. Learning also happens while players explore the game, navigate through different stages and make sense of the complexity of the game. While evolving in a game, players are able to deduce the rules of the game instead of consulting manuals [31]. Immersion in games affords players the opportunity to observe roles, to recognize that our life is similar to life in a game, to identify with characters, and to assume new roles [6]. In addition, online gaming provides players with a wider social context wherein they can connect with other people and participate in similar experiences. They are able to share game strategies, rules and feedback resulting a new knowledge [6].

The learning process usually follows these steps: practice activities, make mistakes, get feedback, think over the feedback, and try again. GBL encompasses these steps by providing players with experiences, allowing them to make mistakes, and providing feedback. Players are more willing to make mistakes and learn from them in a game than in real life, because of the perceived consequences related to failure. Consequently, making risk-free
mistakes becomes a primary path to improvement and is a driver for players to continue try-
ing [30]. By using GBL, students who fail in the game do not feel ashamed of their mistakes as those who have a low score on school examination. They just continue trying to win by playing again and again until the last stage of the game. This persistence allows the player to achieve a deeper understanding and to devise a sound solution to correct mistakes. As a result, mistakes will motivate the players to not give up, recognize and understand the reason behind their mistakes, and continue working towards the right solution.

2.4 Games Genres

Games are generally classified into eight main genres: (1) action, (2) adventure, (3) strategy, (4) simulation, (5) shooter, (6) sports, (7) role-playing, and (8) puzzle games [31]. Simple games may belong to one genre only, while more complex games may use elements from several genres. For example, an action game can use elements from the adventure and puzzle game genre to enhance the game playing experience, but it will still be viewed as an action game [41]. Table 2.1 shows examples for each genre [47].

2.5 Enjoyable Games

There exist different views about the characteristics of an enjoyable game. For example, Thornton claims that interactivity is an essential aspect of a game [30]. However, Johnston suggests that the dynamic visuals, rules, goals and interaction are the essential features [30]. Baranauskas states that the essence of playing is challenge and risk [30]. According to Malone, four motivating elements of computer games can be defined: fantasy, curiosity, challenge and control [30]. To build an enjoyable game, there are several aspects we need to focus on. The story, narrative and the idea of a game are very important. They must relate to the subject of the material that the player should learn. The concept of narrative is linear: a story must have a beginning, middle, and an end and follows a structure of increasing tension, climax and resolution [37]. In addition, colors, sounds, animations and graphics attract the player to play and be happy [6]. “Powerful graphics, sound and physical models
<table>
<thead>
<tr>
<th>Type of game</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Ball and paddle</td>
</tr>
<tr>
<td></td>
<td>Pinball game</td>
</tr>
<tr>
<td></td>
<td>Traditional Fighting game</td>
</tr>
<tr>
<td>Adventure</td>
<td>Real-time 3D adventures</td>
</tr>
<tr>
<td></td>
<td>Text adventures</td>
</tr>
<tr>
<td></td>
<td>Graphic adventures</td>
</tr>
<tr>
<td>Strategy</td>
<td>Real-time tactics</td>
</tr>
<tr>
<td></td>
<td>Tower defense</td>
</tr>
<tr>
<td></td>
<td>Turn-based strategy</td>
</tr>
<tr>
<td>Simulation</td>
<td>Management simulation</td>
</tr>
<tr>
<td></td>
<td>Life simulation</td>
</tr>
<tr>
<td></td>
<td>Vehicle simulation</td>
</tr>
<tr>
<td>Shooter</td>
<td>First-person shooter</td>
</tr>
<tr>
<td></td>
<td>Light gun shooter</td>
</tr>
<tr>
<td></td>
<td>Third-person shooter</td>
</tr>
<tr>
<td>Sports</td>
<td>Racing</td>
</tr>
<tr>
<td></td>
<td>Sports game</td>
</tr>
<tr>
<td></td>
<td>Sports-based fighting</td>
</tr>
<tr>
<td>Role-playing</td>
<td>Dungeon Crawler</td>
</tr>
<tr>
<td></td>
<td>MMORPG</td>
</tr>
<tr>
<td></td>
<td>Action RPG</td>
</tr>
<tr>
<td>Puzzle</td>
<td>Matching</td>
</tr>
<tr>
<td></td>
<td>Word and Number</td>
</tr>
</tbody>
</table>

Table 2.1: Game genres

provide a high fidelity environment," but Low argues that such realism may distract from the interaction rather than enhance it and “games don’t fail because they look unrealistic, they fail when they don’t make sense”[37]. Besides that, the player likes to confront challenges and win the game [13]. Furthermore, it will be better if there is an interaction between player and game [39]. As Malone suggested in the 1980’s, educational games should have well-defined goals that enable a player to get meaningful, multiple difficulty levels to adapt the game difficulty to learn a skill and random elements of surprise [5]. Mount (2002) describes gameplay elements which “when implemented in an interactive environment, ensure that the end user can make interesting choices, thus leading to a vicarious experience which is both memorable and fun". Mount’s elements of gameplay for a successful game include: challenge vs frustration; risk vs reward; and “polymorphism", that is, allowing different forms (styles) of play[37]. Consequently, several significant criteria must be considered
by game designers when developing games. These criteria include players’ age, gender, competitiveness, and previous gaming experience. Moreover, the number of players (single or multiple) and the degree of their collaboration/interaction are important criteria. Also, a player enjoy when he is unable to predict and he does not know what will happen then on the scene, a player feels elated when he faces a challenging problem and trying to solve it [39]. A player tries to deconstruct the game to become simple and clear then discovers what will be next, all of that makes the game enjoyable [37]. At the conclusion, each new game must rethink how it should absorb the player, and the best games succeed by finding new structures of interaction, inventing new genres [37].

We surveyed university students to assess their opinions about attributes that contribute to game enjoyment. The results (Figure 2.3) show that the idea of the game received the highest percentage in terms of what is most important. Challenges that the game offers are next followed by animation and graphics.

![Figure 2.3: Attributes of Enjoyable Games.](image)

In summary, to build a successful game, there are six key structural elements a game
designer must focus on. These are shown in Table 2.2 [32].

<table>
<thead>
<tr>
<th>Structural elements</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rules</td>
<td>- Force a player to take specific paths to reach goals.</td>
</tr>
<tr>
<td></td>
<td>- Put a player in the game world.</td>
</tr>
<tr>
<td></td>
<td>- Make things both fair and exciting.</td>
</tr>
<tr>
<td>Goals or Objectives</td>
<td>- Big piece of what motivates a player.</td>
</tr>
<tr>
<td></td>
<td>- Goals push a player to achieve and to win.</td>
</tr>
<tr>
<td>Outcomes and Feedback</td>
<td>- Comes when something in the game changes in response to what player do.</td>
</tr>
<tr>
<td></td>
<td>- Enhance the players’ experience and move player along in the game.</td>
</tr>
<tr>
<td>Competition / Challenge</td>
<td>- Problems in a game a player trying to solve.</td>
</tr>
<tr>
<td></td>
<td>- Does the player excited about playing the game.</td>
</tr>
<tr>
<td>Interactivity</td>
<td>- Interaction of the player and the computer.</td>
</tr>
<tr>
<td></td>
<td>- Interaction of the player and other players.</td>
</tr>
<tr>
<td>Representation</td>
<td>- The game is about something.</td>
</tr>
<tr>
<td></td>
<td>- Includes an element of fantasy.</td>
</tr>
</tbody>
</table>

Table 2.2: Key design elements

2.6 Advantages of Game-Based Learning

GBL is characterized by immersion, direct experience, challenges, collaboration, and mobility. GBL creates for students a highly motivating environment that immerses them into learning tasks. Immersion enhances concentration and lengthy attention span, thus increasing the effectiveness of the learning process. GBL structures knowledge acquisition as an experimental activity. This direct experience consists of constructing one’s own knowledge through exploration, and trial and errors. Gaining knowledge from mistakes without any fear of consequences promotes individual persistence and deep and meaningful learning [44]. In their quest and desire to achieve successful goals, players face physical and intellectual challenges. Faculties, such as analysis, decision-making, pattern recognition, dexterity, and quick thinking, are exercised and honed. In a multi-player setting, players engage in collaboration, discussion, and knowledge sharing. This social engagement among peers strengthen their learning skills [30]. Similarly to mobile learning, GBL is supported by smart devices making it available “anywhere, anytime”. The following list reflects some benefits of using the GBL in educational process as shown in Table 2.3.
1 Motivate the learner.
2 Grab the learner attention.
3 Reinforce knowledge efficiently.
4 Games provide embedded immediate feedback.
5 Autonomous learning.
6 Helps with fast strategic thinking & problem-solving.
7 Integrated skills.
8 Students get a positive experience about learning.

Table 2.3: Benefits of GBL

2.7 Disadvantages of Game-Based Learning

Harmful effects of media, such as T.V. and films, have been thoroughly investigated. Similar investigations are being carried out to assess the impact of video games and to show the links between game playing and negative behavior. A large number of successful commercial video games depict violence, aggressive behavior, and stereotyping in trivial ways leading to desensitization and re-enactment by players [12, 5]. Several related tragedies have been reported in the general press. Excessive game playing may lead to addiction for some students, resulting in a substantial increase in playing time, activity displacement, and physical harm to eyesight, hands, and posture. Instead of attending the school and socializing with other people, addicted students will stay home, preferring to live in the digital world, thus causing isolation and inadaptation. Moreover, playing and experiencing pleasure when playing the game cause escapism and denial of the challenges of real-life. Also, If the game culture is not designed properly, the player will acquire inconsistent information. To avoid harmful effects and develop effective games for learning requires a set of complex skills. Table 2.4 summarizes some disadvantages associated with games.

| 1 | Lack of face-to-face interaction. |
| 2 | Cost and technical issues.        |
| 3 | Time and effort consuming.        |
| 4 | Ever changing technologies        |
| 5 | Harmful for the player eyes, hands and backbone. |
| 6 | Isolation and escape into the digital world. |

Table 2.4: Disadvantages of Games
2.8 Conclusion

The main task of this chapter was to situate game-based learning. First, we introduced game-based learning by discussing the definition of GBL and the state of the art of video games in general. Then, we explained what is learning from games and identified game genres. Moreover, we investigated attributes that make games enjoyable. Finally, we summarized the advantages and disadvantages of game-based learning.
Chapter 3: Arabic Game-Based Learning

Language competency is critical in the early development of children. It is fundamental to academic and social success. Traditional education is in need of alternative resources to enhance its effectiveness. Learning Arabic within the classroom faces great challenges in that it is not reinforced outside the classroom. Thus, providing opportunities for learners to acquire linguistic knowledge outside the classroom in a systematic and coherent way would provide these alternative resources. GBL can be used to address this issue of reinforcement outside the classroom. Our major objective is to develop a GBL model to support the Arabic language. This chapter investigates GBL issues and resources in the context of Arabic.

In section 3.1 we analyze some Arabic educational games and summarize their major characteristics. As dictionaries are important language resources, we overview the state of Arabic dictionaries in section 3.2 and compare them with other dictionaries to highlight the missing features from Arabic dictionaries. In section 3.3, we discuss three curriculum surveys we conducted: (1) Questionnaire for Kindergarten teachers, (2) Visit to Kindergarten, (3) Interviews with Kindergarten teacher, to discuss and conclude findings each of them in details. Education System In the United Arab Emirates will investigate in section 3.4 in details and find out the curriculum content model for the kindergarten stage in the UAE. We will overview the Abu Dhabi Education Council (ADEC), the Dubai Education Council (DEC) and the UAE Ministry of Education (MOE) in detail. In section 3.5, we review the curriculum content model for the kindergarten stage in the Arab World. In section 3.6, we summarize our findings and highlight the important points to improve the education process.

3.1 Arabic Game-Based Learning

The basic issue we are facing is the definition of a GBL model. To delimit the progress in GBL modeling, we review some existing Arabic games intended for education of children. We found that there are very few games for learning Arabic dedicated to children. Generally, they are simplistic and tend to revolve around the same trivial idea. The overall presentation
lacks quality in terms of graphics, animation, colors, and voice-over. Moreover, none of these Arabic games shows a systematic design process. In what follows, we will analyze some existing games. Figure 3.1 describes their major characteristics. We chose the following games: “Hrwfy Almrht” [5], “Aswaty Almrht” [4], Abjad [38], “Adnan” [50], “Braeem” [35], “My first Book” [16], and “Fun with Arabic” [40]. As shown in table 3.1, we analyze them in terms of the nature of the contents, the organization of the contents, gameplay, interactivity, graphics and assessment

<table>
<thead>
<tr>
<th>Game name</th>
<th>Picture</th>
<th>Description</th>
</tr>
</thead>
</table>
| Hrwfy Almrht    | ![Picture](hrwfy.png) | • This game gives the player options to learn the alphabetic and provide them with some words and pictures related to that letter.  
• The player can play a game of multiple choice to choose word related to the alphabetic.  
• The player may paint some picture. |
| Fun with Arabic | ![Picture](funarabic.png) | • The player can go through four path on this game  
1. Learn the letters only with how to say it.  
2. Learn the letters with picture related to that letters.  
3. Learn how to write the letters.  
4. Letter reorganization. |
| Abjad           | ![Picture](abjad.png) | • The player of that game only have view randomly an alphabetic with word, picture and the sound of that picture. |
| My first Book   | ![Picture](myfirstbook.png) | • This game display each alphabetic with many pictures related to it.  
• Each pictures has voice and the name of it.  
• Th e game have song of Arabic alphabetic. |
| Braeem          | ![Picture](braeem.png) | • This game gives the player many choices to learn:  
1. The shape of the alphabetic with voice.  
2. The numbers’ shape with voice.  
3. Multiple choice to choose picture related to the alphabetic.  
4. Multiple choice to choose picture related to the word.  
5. Also it has songs of Arabic alphabetic. |
| Aswaty Almrht   | ![Picture](aswaty.png) | • This game give the player chance to learn the voice of things like animals and machines.  
• Also the player can learn how to talk and say some simple sentence.  
• The player can play a game of multiple choice to choose word related to the voice. |
| Adnan           | ![Picture](adnan.png) | • The player can go through three paths on this game  
1. The player can learn the holy Quran “جزء عن آية ” سورة ” until he finishes memorize it.  
2. The second path is “ غوقة الأذكار ” to learn how to pray to Allah. The player navigates inside the room and listen to the “ الساع.”  
3. Choose letter to listen to song related to that letter with pictures. |

Figure 3.1: Descriptions of Arabic Educational Games.

By reviewing the characteristics of each previous game, we found that; 1) “Hrwfy Almrht” is based on alphabet content. It has sounds that guide the player. The graphics are
Table 3.1: Content Analysis of Arabic Educational Games

<table>
<thead>
<tr>
<th>Game name</th>
<th>Content</th>
<th>Organization of the contents</th>
<th>Interactivity</th>
<th>Graphics</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hrwfy Almrht</td>
<td>Alphabet</td>
<td>Randomly</td>
<td>Sounds guide the player</td>
<td>Colorful</td>
<td>Multiple choice question</td>
</tr>
<tr>
<td>Fun with Arabic</td>
<td>Alphabet</td>
<td>Organized</td>
<td>Boring</td>
<td>Poor</td>
<td>Multiple choice question</td>
</tr>
<tr>
<td>Abjad</td>
<td>Alphabet</td>
<td>Randomly</td>
<td>Boring</td>
<td>Poor</td>
<td>Not have</td>
</tr>
<tr>
<td>My first book</td>
<td>Alphabet</td>
<td>Organized</td>
<td>Boring</td>
<td>Poor</td>
<td>Not have</td>
</tr>
<tr>
<td>Braeem</td>
<td>Alphabet Words</td>
<td>Organized</td>
<td>Boring</td>
<td>Colorful</td>
<td>Multiple choice question</td>
</tr>
<tr>
<td></td>
<td>Numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aswaty Almarehat</td>
<td>Pronunciation</td>
<td>Randomly</td>
<td>Sounds guide the player</td>
<td>Colorful</td>
<td>Multiple choice question</td>
</tr>
<tr>
<td></td>
<td>sentence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adnan</td>
<td>Holy Qur’an</td>
<td>Organized</td>
<td>Sounds guide the player</td>
<td>Colorful</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Doaa Alphabet</td>
<td></td>
<td></td>
<td>Easy to</td>
<td>navigate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>navigate</td>
<td></td>
</tr>
</tbody>
</table>

The player is assessed by multiple-choice questions. However, there is no variety in the content. Only the alphabet is teachable in this game. 2) “Fun with Arabic" has the same idea, which includes the alphabet content, but it is more organized than the “Hrwfy Almrht". It does not have an interaction between the player and the game itself, which makes the player get bored very quickly. It uses multiple-choice questions to assess the player. 3) The player in “Abjad" has to choose a letter without any interaction. If the player is aged 3 and below, then he/she will get bored of the game immediately as it does not match the skill level of the player. 4) “My first book" shows real pictures of animals, but the player has to be more than 3 years to play it. It is organized according to the alphabet order, but it has a poor design. 5) “Baraeem" assumes that the player already knows the letters in order to be able to play the game. It shows the player the alphabet, words and numbers, but in an unattractive design. 6) “Aswaty Almarehat" is for pronunciation of sentences. It has sounds that guide the player. The graphics are colorful by it is organized.
randomly. The player is assessed by multiple-choice questions. This game only teaches the sounds of the animals and machines. 7) “Adnan” has three contents; the Holy Quran, the player room and the alphabet. The player room gives players the choice to navigate inside the bedroom and listen. This game displays random letters and the player selects one to hear the song related to that letter with pictures. It has sounds that guide the player. Also, the graphics is colorful and easy to use and navigate. The game does not have any assessment tools.

In summary, the majority of Arabic games is limited to alphabet content. They do not have the ability to engage the learner in the game. The ideas of the game are repetitive. Most of them focus on the letters themselves and how to pronounce them. They display some pictures with the letters and some songs. There is no systematic organization of the contents of the games. It is either display by the sequence of letters or randomly. On the other hand, the designs of the games are not attractive and they are either specialized in some parts of the learning techniques like: sounds or pictures or they do not relate to the level of a player’s skill. Moreover, it is noticeable from the previous games that the goal of the game should achieve is not clear. There is no intermediate interaction between the player and the game. There is no flow that matches the player skill level. However, the model works only as a link between educational theory and game design and does not provide the means to a whole game design project.

Furthermore, we found that the presentation of the previous games in term of graphics and sounds need to be more appropriate for the learner at the age of 3 years. The Arabic games need to develop a new ideas and be more interactive. The repetition of the same features reduces the attractiveness of the game. An important point is the assessment that is missing; we need to develop new assessment techniques suitable for GBL.

### 3.2 State of Arabic Dictionaries

Dictionaries have been considered as the primary sources for vocabulary enrichment, and one important learning tool, because they contain rich information on vocabulary. Indeed,
dictionaries provide linguistic information not available from other sources. Also, vocabulary acquisition is a primary basis for language competency. Dictionaries have been used as a resource to enrich vocabulary. Beside, learners can understand better the language and making them able to use the language precisely. Likewise, using dictionaries makes the process of language learning more efficient and fun [27].

The general trend in dictionary development is towards the introduction of interactivity and visualization. Not only do they effectively capture the traditional didactic concepts, modern e-dictionaries provide structures and functions that support and encourage learning. To a certain extent, they can be viewed as a scaled down version of GBL, which can be used as a subcomponent.

To synthesize the dominant features and trends, we conducted a comparison of current dictionaries features in different languages. We selected some representative English and French dictionaries available on the web, which provide many features like searching (by image and by category) and finding detailed descriptions. For comparison purposes, an Arabic dictionary was also included. This study was intended to identify possible features that enhance the ease of learning a new language.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Search by keyword</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Search by Image</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Search by categories</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Colored illustrator</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Details diagrams</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Details descriptions</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Archive of game that engages vocabularies</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Has tools category that explains how to include the illustrations and</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>terminology found on <a href="http://www.visuldictionaryonline.com">www.visuldictionaryonline.com</a> in your blog,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>website, home page and presentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has book category to buy the visual dictionary online through website</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>like Amazon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Has software category for new products</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>It supports thesaurus:</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>1. Synonyms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Related words</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Phrases</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Near Antonyms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Antonyms</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Opposite</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choose the source dictionary you want to get the meaning from it</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It support read the English word as Arabic and find its meaning</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It supports sound</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 3.2: Dictionary Comparison

As shown in Table 3.2, the English and French dictionaries provide a rich set of features that are attractive to learners. They provide full descriptions of meaning with a picture, videos, and illustrations to capture fully the concepts. However, Arabic dictionaries have fewer features making it more difficult to learn a new vocabulary. At this stage we were able
to assess what we need to develop in order to improve Arabic dictionaries and to bring them to the same level of the English and French dictionaries or even better. Table 3.2 shows a sample of the features that were investigated in the study. Arabic dictionaries, whether electronic or hard copy, lack organization and learning support methods, such as diagrams and illustrations [10]. As figure 3.2 shows, the Arabic dictionary needs to be more appropriate to use by a student. When we want the learner at the beginning level of his education to use the dictionary and learn new knowledge. There is a lack of diagrams and colors and this will be hard for the learner to understand the meaning and link between the words and figures. Also, by comparing the Arabic dictionary with the the English dictionary, we find that the number of words that is on one page of dictionary are different as figure 3.3 display. As we are looking to improve the state of the dictionary for the children at the beginning stage of learning, we assessed what is offered. We found an English dictionary for the children to learn the first 100 words [17] in Arabic. This dictionary is designed to teach the beginner a basic vocabulary of 100 Arabic words. Furthermore, it organizes topics around themes, such as home, clothes, town (including transportation), countryside, essentials, opposites, animals and parts of the body. By reviewing this dictionary, we discovered that the non-Arabic people develop a better dictionary for their child to learn Arabic. The features of “Your First 100 Words in Arabic” are as follows [46]:
• The introduction provides a helpful insight into the Arabic alphabet and shows you how Arabic letters are joined to form words.

• Scriptbreaker Tips help you focus on how to read Arabic.

• A Pronunciation Guide describes the sounds of Arabic.

• Eight Topic Chapters group the words by theme: around home, clothes, town, countryside, opposites, animals, parts of the body, useful expressions.

• Each of the 100 Words is clearly presented in Arabic script, with its English meaning, pronunciation, and an illustration to aid memorization.

• Tear-out Flash Cards help you recognize the Arabic words and learn their meaning and pronunciation. The instructions explain how to use the flash cards as an effective learning tool.

• Extensive Games and Puzzles-matching exercises, word searches, and memory tests-provide a fun way to test your ability to read, pronounce, and understand the words in each chapter.

• Finally, a round-Up chapter enables you to review all 100 words presented in the book. Answers to all exercises are included.

The importance of using dictionary in language learning cannot be overstated. When the learner is in need of a dictionary in a given situation to achieve a certain purpose, he/she ought to use the best dictionaries to achieve the goal sought. In addition, the learner should not struggle with the structure of the dictionary and how to find information. Besides, the type and amount of information should assist the learner to get what he wants quickly and skillfully. Thus having an age-aware and specific dictionary for each stage of education level will enable the learner to gain information from dictionary precisely. In turn, this will help remembering the information and its context on a longer basis. Arabic dictionaries are not only counter-intuitive, they are unattractive. Rather than being learning tools, they become useless resources.
3.3 Curriculum Survey

An ideal kindergarten classroom is a safe environment that provides ample opportunity for children to play, which in turn develops confidence and social skills [22]. Kindergarten teachers face a unique set of challenges as they strive to meet the needs of very young children. In Kindergarten we should trigger the children’s curiosities and look after their interests. At this crucial stage of education, the children’s excitement abounds about everything around. Correspondingly, the more hands-on the activity is, the more learning styles we are renting, and the more the child enjoys it the more they will learn and retain. In order to understand the nature of the Kindergarten curriculum in the United Arab Emirate, we conducted a survey to find out how children learn, what they learn and what are the methods used by Kindergarten teachers. We developed three kinds of surveys; (1) Questionnaire for Kindergarten teachers, (2) Visit to Kindergarten, (3) Interviews with Kindergarten teachers.

3.3.1 Kindergarten Teachers Questionnaire

We selected three Kindergartens in different cities (Al Ain, Fujairah, and Dubai) and sent a questionnaire for teachers to address the following questions:

- Q1: How do you select the learning content?
- Q2: How is your material organized?
- Q3: What are the methods you use?

By analyzing the answers, summarized in table 3.3, we found that: 1) One educator stated that he did not have a curriculum and it was his responsibility to choose the learning content and organize it. On the other hand, two educators stated that the Ministry of Education gives them the curriculum; 2) the organization depends on what the Ministry of Education gives them and one Kindergarten the educator organized the curriculum based on the learners’ level; 3) moreover, each educator had her own way of teaching methods with various resources such as: cards, stories, video, songs, kinetic games, online games and
Que. | Teachers’ answers
---|---
Q1 | Teacher 1: The Ministry of Education gives us the curriculum content model. 
Teacher 2: The Ministry of Education gives us the curriculum content model. 
Teacher 3: It is free, I choose what I see suitable for this level.
Q2 | Teacher 1: it depends on what the Ministry of Education arranged. 
Teacher 2: It depends on what the Ministry of Education arranged. 
Teacher 3: I organize it depending on the learner's level.
Q3 | Teacher 1: I use stories, songs, kinetic games and collect points to win a gift. 
Teacher 2: I use iPad games, videos, songs, stories and educational tours. 
Teacher 3: I use stories, cards, pictures, songs, online games.

Table 3.3: Kindergarten Teachers Questionnaire Answers

others. Overall, the impression is that the learning content and the methods depend on the teachers.

### 3.3.2 Kindergarten Visit

Furthermore, we visited the Al-towayya Kindergarten in Al Ain city. This Kindergarten has two levels, KG1 and KG2. Educational activities are in Arabic and English. They teach Islamic Studies and Arabic words, math, sports and music in both Arabic and English. The English language is taught by foreign teachers. One goal of the visit is to observe directly the children learning, the setup of the learning environment and to interview the teachers.

![Figure 3.4: Kindergarten Activities Corners](image-url)
We attended the usual learning day in Kindergarten and saw how students reacted and learned in the classroom with their teacher. Each classroom consists of many environments. As figure 3.4 shows, the classroom has several corners: library, kitchen, drawing and modeling clay. This set up may attract students to learn within the classroom by trying, touching and playing. The classroom contains a collection of hands-on learning materials that help students to understand better. There are books and printed material to support early writing skills of the student. Also, to help students learn how to count and measure, there is a section dedicated to math resources, such as blocks, counters, dice, rulers and number markers. In between, students take breaks to go for walks around the school or skipping up in specific areas. Furthermore, each classroom has two teachers, Arabic and English teachers. The English teacher had more resources, such as games, stories, songs and pictures than the Arabic teacher. We found that they faced difficulty teaching Arabic with a lack of resources, such as games, stories, songs, pictures and videos. Inside the classroom the teacher is responsible to determine what to learn, and organizes the materials to give it to students. Besides, the teacher involves student to set goals and plan of the day in order to encourage them to take ownership of their learning and being more active.

3.3.3 Educator Interview

Kindergarten teachers play an integral role in early childhood development by fostering basic intellectual and social foundations. To build these foundations, kindergarten teachers implement several teaching methods that challenge students to express themselves while learning. Successfully teaching kindergarten is about finding the right balance between fun and learning [22]. We interviewed Kindergarten teachers teaching the Arabic language. The interview went as follows:

- Q1: How do you select the learning content?
  The learning content is decided by ADEC. They give us a list of outcomes and a matching curriculum that determines the learning content.

- Q2: How do you organize the contents?
I plan my lessons to a whole group and then assess to see who understands the concept. For those that do not understand I re-teach. For those who understand I give them more enriching activities to push them forward. I try to vary my lessons to appeal to all learning types: visual, tactile, etc.

• Q3: What kind of resources do you use?

The resources that we want the children to use are stored in open baskets on low shelves so that they can move one center to another easily. The shelves are grouped by learning center: reading, writing, math, fine motor, etc.

The teachers’ answers help understand clearly the responsibility of the teacher in the teaching process. We found that the Ministry of Education creates a curriculum content model for each subject. As well, the curriculum content model is organized and the teachers must follow it. Each teacher has individual teaching methods depending on his experience and the preparation of his students.

3.4 Educational System In the United Arab Emirates

In this section, we review the state of education in the United Arab Emirates. As the founder of the UAE His Highness (H.H.) Sheikh Zayed Bin Sultan Al Nahyan noted, “The real asset of any advanced nation is its people, especially the educated ones, and the prosperity and success of the people are measured by the standard of their education” [42]. Also, he noted "The greatest use that can be made of wealth is to invest it in creating generations of educated and trained people" [42].

The education system of the United Arab Emirates is relatively new as this country is just 44 years old. The government funds public education and the curriculum is created to match the UAE development’s goals and values. The medium of instruction in the public school is Arabic and English as a second language is emphasized. Education reform focuses on better preparation, greater accountability, higher standards and improved professionalism [42]. In the UAE there are three institutions for education: the Abu Dhabi Education Council
Currently, the UAE offers a comprehensive education to all male and female students from kindergarten to university. Education for the UAE citizens is free at all levels [42]. In the following, we will introduce the three institutions in some detail.

### 3.4.1 ADEC Kindergarten Program

For Abu Dhabi Education Council, Kindergarten is designed to prepare children to be successful in Cycle 1 and beyond. At the Kindergarten level, the students spend time developing social, language, physical and academic skills. ADEC, through the learning outcomes, focus on higher order thinking skills, analysis, synthesis and effective communication, skills deemed essential for success in the 21st century [1]. The ADEC Kindergarten program consists of 2 levels: Kindergarten 1 (KG1) and Kindergarten 2 (KG2). Students in KG1 must be 4 years old by October 01 of the year of entry and students in KG2 must be 5 years old by October 01, of the year of entry. Also, Kindergartens operate daily, five days a week. The length of the school day is 4 hours, 30 minutes with school typically starting at 8:00 AM and ending at 12:30 PM each day. The school year consists of 3 terms; each approximately 12 weeks [1].

### 3.4.2 DEC Kindergarten Program

Dubai Education Council (DEC) was set up under the directives of H.H. Sheikh Mohammed Bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai. As part of its action plan, Dubai Education Council (DEC) seeks to raise the quality of Dubai’s education sector to meet global standards. While developing standards, DEC also seeks to preserve local traditions, principles and the cultural identity of the UAE [14].

The mission of the Dubai Education Council is to:

- Enhance the education sector in Dubai at all levels to bring it up to international standards while maintaining cultural and social values.
• Further develop the educational institutions in order to create a knowledge-based society.

3.4.3 MOE Kindergarten Program

We reviewed the curriculum content model of the Ministry of Education in the UAE[26]. As the index in figures 3.5-3.6 show, the curriculum content model of the Ministry of Education is arranged from kindergarten to high school. Each stage has different language skills depending on the characteristics of learners at each stage of education. Since our focus is on the kindergarten stage, we review language skills and criteria of this stage.

Figure 3.5: Curriculum Content
Language Skills

The Arabic language curriculum for Kindergarten is based on four sections representing the basic language skills: listening, speaking, reading, and writing. Learners begin to learn listening and speaking skills and apply them in a way that is suitable for the Kindergarten stage. Pupils practice simple forms of reading skills, such as reading letters, words, and some simple sentences often accompanied by pictures and drawings. They start the first writing operations by following dotted words, writing their names, and practicing writing and drawing to express their thoughts and feelings with pictures and short sentences.
Criteria

The criteria describe the knowledge and skills and the level of understanding that the learner is expected to achieve at the end of kindergarten:

- Communicate with others by listening and speaking in different contexts and for different purposes.

- Learner shows a good understanding of a variety of reading materials read by the teacher or with the assistance of the teacher. (What is known as shared reading)

- It uses appropriate literacy strategies which help him to understand a variety of written materials suitable for this stage.

- Connect with others by writing.

- Learner shows an understanding of visual information materials (cartoons, movies, ads, etc.)

In studying Arabic, students need to develop their skills in reading, listening, speaking, and writing. These skills enable them to communicate and express themselves. Students in Kindergarten learn to speak confidently, listen to others, read and write independently.

3.5 Curriculum Content Model in the Arab World

The UAE is not the only country in which the importance of learning Arabic is high on the agenda. Other Arab countries are trying to develop strategies to make Arabic exciting for the children. In this section we will cover the curriculum of the kindergarten in some Arab countries like Kuwait to understand how the curriculum is developed. Also, we will review some kindergarten websites in the UAE and Bahrain to see how their programs are structured.
3.5.1 Curriculum Content Model In Kuwait

We go through the curriculum content model of the Kuwait Ministry of Education. We seek to understand the extent of content student in the kindergarten stage are exposed to and the way of teaching is carried out. The following points describe the goals, characteristics and the basic concepts of teaching Arabic language in Kindergarten stage.

The Committee on Kindergarten Curriculum Development in the Ministry of Education established ten general goals for the Kindergarten in Kuwait. The aims are[2]:

- To help children gain religious beliefs and ideas.
- To help children acquire a sense of belonging: to their family, society, the Arabian Gulf, the Arab nation, and the Islamic nation.
- To promote strong self-esteem.
- To help children acquire the means to be honest and be positive in their relationships with adults.
- To help children learn responsibility and independence, and learn the acceptance of living in a cooperative society.
- To help children become aware of their physical needs, keeping their bodies safe and healthy, to practice healthy habits in playing, relaxation, sleeping, eating, and dressing, and to acquire the habits of security at home, outside, and within the kindergarten.
- To help children develop their five senses, develop control and appreciate the use of their bodies, and to develop a positive sense of self.
- To help children acquire basic living capacities.
- To help children extend their concern for and conception of their natural surrounding environment, dealing with it in a positive way (Kuwait Ministry of Education, 2007).

The goals of teaching Arabic language in Kindergarten stage [20]:
• Acquire the primary skills of the initial reading.

• Growth of the child’s ability to speak and express his thoughts and feelings and needs.

• Acquire good listening awareness of the texts and speakers skills.

• Expand of the child’s imagination, and provide opportunities to develop creative energies.

• Raise the interest in Arabic speech.

Foundations and characteristics of teaching Arabic language in Kindergarten stage [20]:

• Understanding the nature of learning Arabic language And distinguish their characteristics.

• Distinguish nature of the learner at this age level and his psychological characteristics.

• Consider the nature of society and its philosophy.

Define the basic concepts of the Arabic language as follows [20]:

• Linguistic communication: listening, repeating and reading.

• Words: read words, and distinguish among them.

• Letters: identify letters in pronunciation and writing.

As figure 3.7 shows, the curriculum provides the Kindergarten teacher with the plan with details and lessons. This means that all kindergartens in Kuwait must follow this plan. The curriculum provides a rich set of examples, images and ideas for the kindergarten teacher. In addition, kindergarten teachers have the choice to use any teaching methods to accomplish the outcomes according to requirements.

In Kuwait each kindergarten classroom is divided into several segments called “learning centers”. Moreover, the curriculum content includes twelve themes: my kindergarten, I am human, people work, my nutrition, water and air, animals and plants, the four seasons,
my religion Islam, Kuwait my country, communication and transportation, the oil, and the sea. Children are taught about language, literature, arithmetic, natural science, music, art, motor skills, role-play, and creativity. Each of the themes used in Kuwaiti kindergartens runs for two weeks at a time [2].

### 3.5.2 Kindergarten Curriculum Samples

In what follows, we will review material found on websites of Riffa Views International School and Kindergarten program at Al Nur School to highlight the importance of kindergarten programs.

### Riffa Views International School

The Arabic program at the Riffa Views International School (RVIS) in Bahrain was designed to give the students an Arabic language and cultural education that is based on best practices in the field, and on an immersion in literacy approach. At the pre-kindergarten and kindergarten level it utilizes a communication-based approach which focuses on giving the students the skills that they must master in order to be at the level of Arabic. Riffa Views International School strives to develop students who are [11]:

---

**Figure 3.7: Kuwait Curriculum Content Model**

---
• Self-directed, active learners
• Questioners
• Decision makers
• Problem-solvers
• Collaborators
• Skilled communicators

Resources: The Arabic program uses a whole range of resources rather than a specific textbook, including a large collection of authentic and international children’s literature, workbooks that blend art with writing, and book making [11].

**Kindergarten Program at Al Nur School**

Children in the Kindergarten program at Al Nur School explore the concepts listed below. They learn these concepts at their own pace and are taught with hands-on materials, as well as with traditional methods [3].

**Goals**

• Provide a safe and loving environment for all children.
• Foster a sense of self-confidence and well-being in each child.
• Expose children to and build a love for grade appropriate reading, math, science, Arabic, Quran, social skills, art, and movement.
• Provide physical activities to facilitate gross and fine motor development.
• To develop in children and parents a positive attitude towards self, others, school and learning.
Arabic

- Recognize Arabic letters and the letter sounds.
- Recognize the alphabet with fatha, kasrah, dhammah and sukuun.
- Begin reading with connecting the letters to form words.
- Listen to stories in Arabic daily.
- Write Arabic letters.
- Write Allah and Bismillah in Arabic.
- Write their name in Arabic.
- Write and read simple Arabic words.
- Know 8 basic color words in Arabic.
- Learn the basic shapes in Arabic.
- Recognize and write Arabic numbers.
- Learn from 100 to 150 new Arabic words.
- Conversation:
  - Build Listening skills.
  - Learn to use Arabic greetings and expressions, and hold basic conversations in Arabic.
  - Use Arabic in the classroom and in daily interactions.

3.6 Conclusion

When comparing the Arabic curriculum from various sources, we find that there is a core of requirements that is common to help teachers provide a sound education that addresses the needs of the children. However, the biggest problem for teaching Arabic and other subjects
in Arabic is a lack of resources to make the teaching more interesting and effective. Despite the directives concerning the curriculum, schools and teachers are left with the responsibility to provide means to support the Arabic curriculum, because there are very few available resources to use. Although it is the responsibility of the whole nation to be concerned about their language, the responsibility of the teacher is greater. When we analyzed the Kindergarten curriculum we found that the school curricula, management programs and teaching methods are traditional and outdated. Educators expressed a good variety of ideas about the use of games that they wished to integrate. However, they did know how, for there is no instance whose responsibility is to sponsor the educators’ ideas and develop them. In fact, when we analyzed the state of the Arabic educational games we found that game designers were not versed in pedagogy, instructional methods, and learning contents. On the other hand, there are educators with design ideas, but they do not possess the necessary background. There exists a large communication gap between educators, developers and game designers. Besides, educators need assistance with the development of instructional technologies from the developer and game designer. However to solve this challenge and the future needs, the educator, the game designer, developer and other entities, such as Ministry of Education and Ministry of Culture, need to cooperate. Even though documents on curriculum matters mirror global trends, the implementation of the Arabic curriculum lacks not only resources, but also modern instructional methods. It does not match students’ ability to learn, nor take into consideration the interests of each phase of age. One of the most challenging problems facing the educational system in the Arab countries is the lack of qualitative and modern education programs. Part of the purpose of this study is to raise awareness of and bring much-needed accountability to the educate specialized the Arabic and the education in general in Arab countries. It is time to call for action to preserve the Arabic Language. Based on this observation, we think that introducing game-based Learning may help reduce some of these problems and help to improve the education process in the Arab world in general.
Chapter 4: Modeling GBL for Linguistic Skills Acquisition

This chapter presents a concrete model of game-based learning. In our model we used the main principles of game design described in chapter 1, and the implementation approach in chapter 2. This chapter recommends solutions to the major challenges we noted in chapters 2 and 3. Accordingly, the basic GBL design process consists of the following steps:

- Identify the idea and the goal of the model (section 4.1).
- Create the storyboard and the scenes for the model (section 4.2).
- Identify the main model components (section 4.3).
- Elaborate the details of the GBL model (section 4.4).
- Integrate all concepts together to implement the model of GBL (section 4.5).

4.1 Game based Learning Components

A game-based learning system consists of: (1) learning and (2) gameplay. We need to identify the components of each of them, and then integrate them.

4.1.1 Identifying The Components of Games and Learning

Table 4.1 shows the major components of learning and games. Based on the analysis of games, we identified a core of learning components consisting of learning content, structure of the learning content, presentation of the learning content, feedback, assessment. Moreover, game play, story, challenges, decision making, presentation of the game are the game components.

4.1.2 Integration of Games and Learning

The biggest challenge in GBL is how to implement the learning content that is gratifying. Game-based learning is a novel approach to learning. It proposes the integration of two
Learning Games

<table>
<thead>
<tr>
<th>Learning content</th>
<th>Game play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure of the learning content</td>
<td>Story</td>
</tr>
<tr>
<td>Presentation of the learning content</td>
<td>Challenges</td>
</tr>
<tr>
<td>Feedback</td>
<td>Decision making</td>
</tr>
<tr>
<td>Assessment</td>
<td>Presentation of the game</td>
</tr>
</tbody>
</table>

Table 4.1: Major Components of a GBL System

different disciplines, learning and games. These disciplines do not share any common properties; they may even be contradictory to each other. Thus, their integration is a major challenge. Integration is a complex process that requires: (1) identifying the components of each system; and (2) developing a design that provides a consistent view of the two systems.

4.2 Goal of the Model

Believing in the importance of developing an educational game, we focus on how to develop a game for children about 3 years old to learn Arabic in a systematic manner. Exploration is a natural process for children. Thus, we want to give the player a chance to navigate and explore diverse environments and learn in an entertaining way anywhere any time. During exploration, the player is given a wide range of choices and paths to construct his/her knowledge. Such a capability is achieved through interactions and a variety of decision-making points provided by the environment. The structure of the environment is such that navigating it from one scene to another exposes new concepts that lead to the acquisition of new knowledge by allowing the player to associate concepts with objects in the actual world.

4.3 Model Components

The basic idea is to model the child’s world out of diverse familiar environments to immerse the player in activities that are relevant and attractive. Figure 4.1 shows an example of a familiar environment. It is the child’s playroom that contains a variety of objects (some are highlighted within boxes) that the child plays with regularly. In fact, while playing with these objects, the child builds stories and fantasies within this environment, putting himself
in a state of complete immersion.

The activities within a given environment allow the player to explore the surroundings and interact with objects. Interactivity triggers participation, which in turn facilitates learning. Building the model requires addressing the following questions:

- What is the kind of knowledge to be captured?
- How is the learner going to discover this knowledge?
- How is the learning content (source of knowledge) organized?
- How large is the space of choices given to the learner in order to support a flexible and diverse exploration paths?
- How are the scenes (representing familiar environments) synthesized?
- What are possible actions the main character (learner's avatar) is capable of performing?

Concepts, learning process and game mechanics are the three major dimensions of these questions. Each of these dimensions is elaborated next.
4.3.1 Concepts

Similarly to traditional education, the knowledge to be acquired drives the selection of what is to be learned and forms the basis for the learning content. Typically, a set of outcomes is defined and themes and topics are outlined to cover these outcomes. Resources, such as books, are identified and lectures are developed and delivered. The GBL context is radically different. Even though it must achieve the same learning outcomes, it must not just mimic the traditional delivery.

Assuming that the learning content is captured in the traditional resources used in the classroom, this learning content has to be remodeled by carrying out the following steps:

1. Concept selection: in GBL, knowledge must revolve around concepts, not data and information as found in textbooks. Thus, defining a consistent set of concepts to cover the outcomes is not only fundamental, but an arduous task.

2. Concept organization: the sequential structure of textbooks dictates a linear coverage. GBL supports exploration of concepts through various paths. This capability requires a network structure wherein the nodes are concept clusters. Concept clustering and ordering are two major relations required to organize the network structure. Clusters capture relevance and commonalities among concepts, whereas ordering captures the zone of proximal development (Vygotsky’s ZPD [43]) and concept inclusion (notion of concept-subconcept).

3. Concept exploration: gameplay is structured around the concept network structure. That is, progression in the game and allowable paths are prescribed by this structure. Thus, the actions of the learner (player) are defined accordingly.

Given the focus of this research on learning Arabic for KG, the set of concepts is derived from Arabic textbooks, corpora, and dictionaries [9]. Resources in other languages, such as dictionaries and word lists were also a source of inspiration. Altogether, these were used to synthesize familiar environments.
Familiar World

Inside the classroom, the learner depends on the educator to encourage, help, explain and give feedback. The classroom environment lacks context and does not provide opportunities for learners to relate to and make sense of their own experience. Modeling familiar environments in game-based learning provides a concrete representation of the learning content and creates contexts directly related to individual experiences. Contextual information and background knowledge strengthen the learning process and accelerate knowledge acquisition.

The choice of a familiar world is guided by perceptions children have about their own world. Not only is this world concept-rich, but it also immersive in the sense that the child fancies inhabiting it. Figure 4.2 illustrates the decomposition of the universe the child lives in.

![Figure 4.2: Child’s Universe](image)

Based on this universe and the set of concepts, a storyboard consisting of a collection of scenes (tableau) is developed. Figure 4.3 illustrates some of the scenes, which are used for exploration by the learner. It should be noted that besides familiarity, the following criteria are taken into account to construct a given learning environment:

1. Cognitive load: short-term memory requires that a small number of concepts to be
introduced at one time (the magic number $5 + /2 [25])$.

2. Modality: given that concepts may be introduced through different modalities (aural, visual, textual), distractions may result if their use is not balanced.

3. Zone of proximal development: to insure level-appropriate progress on an independent basis, the transition from a cluster of concepts to another should evolve progressively.

Learning involves building meanings. For a child, such meanings are embodied in the associations the learner establishes between concrete objects and attributes related to them. The objects and the attributes define the learning content. Figure 4.4 shows a sample of the learning content.
The child’s universe ("My world") is structured hierarchically and consists of several units. At level one, for example, my town, my school and my home are defined. The next level is a refinement that captures concepts, such as my family, my room, and my pet. The hierarchical organization is achieved by refining higher level concepts to generate concepts at a lower level by introducing more concrete details. Figure 4.5 shows a sample of this hierarchy.

### 4.3.2 Learning Process

As illustrated in Figure 4.6, there are two potential ways for learning to take place. Part A shows the teaching path inside the classroom. There is only one path that is imposed on all students based on what the educator decides. Part B displays the various paths in the game that the player can explore based on individual choices. The player must make decisions to
select which path to follow. This process involves the learner in knowledge acquisition.

An effective implementation of the learning process may not be feasible. Therefore, simpler activities to engage the player into learning have been identified. For example, some of these activities are:

1. Visual differentiation: to acquire knowledge that allows discriminating between objects based on their attributes. For example, initially recognizing the difference between a cow and a hen. Subsequently, recognizing the difference between a hen and a rooster. A gradual increase of the level of difficulty will result in harder challenges.
and thus more discriminated knowledge.

2. Attributes-instance association: each instance (e.g., object) possesses several attributes, such as size, sound, color, usage that the learner is exposed to.

3. Word-instance association: each instance has a name. This association allows the learner to recognize objects by name.

4. Assessment of these activities: this activity allows the system to assess the progress of the learner.

Figure 4.7 shows some possible associations a concept (object/word) may have with various attributes that refine its meaning and give the learner a multi-modal representation of the concept. Multi-modality was shown to enhance retention and recollection [29].

4.3.3 Game Mechanics

Katie Salen and Eric Zimmerman stated that “Core Mechanics represent the essential moment-to-moment activity of players. During a game, core mechanics create patterns of repeated behaviour, the experiential building blocks of play” [23]. Also, “Mechanics are the various actions, behaviors and control mechanisms afforded to the player within a game context,
the mechanics support overall game-play dynamics as Robin Hunicke, Marc LeBlanc and Robert Zubek mention[23]. What the player can do in the game? What other entities can do, in response to player’s actions? What a player and other entities can do within a game would also fall under the mechanics of a game. First, we determine the objects of our model.
As shown in figure 4.8, each object is structured according to attributes it may expose when interacting with the player. Examples of attributes are name, picture, sound, action, and meaning. To interact, an object is endowed with behavior in that it is capable of responding to events. Some objects have more than one event while others do not participate in any. Participating in events results in interactions among objects and the player. One way for an object to respond to an event is to perform an action as shown in figure 4.9. This structure is thus used to capture ways an object informs the player. From a design perspective, this is represented in an interaction matrix as shown in figure 4.10, in which all the interactions among all the objects are specified. Such a specification serves as a basis for implementation.

<table>
<thead>
<tr>
<th>Object name</th>
<th>Pic</th>
<th>Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parrot</td>
<td><img src="image" alt="Parrot" /></td>
<td>Fly / talk with [Ali</td>
</tr>
<tr>
<td>Ali</td>
<td><img src="image" alt="Ali" /></td>
<td>talk with parrot / choose environments / touch animals / have quiz / get coins / listen to songs / watch story</td>
</tr>
<tr>
<td>Amna</td>
<td><img src="image" alt="Amna" /></td>
<td>talk with parrot / choose environments / touch animals / have quiz / get coins / listen to songs / watch story</td>
</tr>
<tr>
<td>Cow</td>
<td><img src="image" alt="Cow" /></td>
<td>Talk with Parrot / move / sound</td>
</tr>
<tr>
<td>Donkey</td>
<td><img src="image" alt="Donkey" /></td>
<td>move / sound</td>
</tr>
<tr>
<td>Donkey</td>
<td><img src="image" alt="Donkey" /></td>
<td>move / sound</td>
</tr>
<tr>
<td>Hen</td>
<td><img src="image" alt="Hen" /></td>
<td>Talk with Parrot / move / sound</td>
</tr>
<tr>
<td>Car</td>
<td><img src="image" alt="Car" /></td>
<td>move</td>
</tr>
<tr>
<td>Cheep</td>
<td><img src="image" alt="Cheep" /></td>
<td>sound / move</td>
</tr>
<tr>
<td>Cow</td>
<td><img src="image" alt="Cow" /></td>
<td>Talk with Parrot / move / sound</td>
</tr>
<tr>
<td>Coins</td>
<td><img src="image" alt="Coins" /></td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 4.9: Example of Objects and Possible Actions

The avatar “Ali” represents the player, i.e. learner, inside the game. Understanding the characteristics of the learner allows us to determine the possible actions he is capable of performing in order to achieve a given goal. At any one point, a possible set of actions is
available for selection. Decision-making is a way for learners to chart the learning activities to achieve their learning objectives.

4.4 Game Structure

The game structure captures the behavior of player-character and non-player characters and their actions. In this section we will go through the steps we followed to build our model.

4.4.1 System Overview

The goal of this project is to create an interactive language-learning environment for children in order to make them learn more vocabulary in an enjoyable way. The main aim of this model is to give the player an opportunity to learn Arabic language through entertainment.
and learning new words. The game system is an adventure theme where the player selects an environment to explore from several choices, e.g., hospital, farm and desert and mosque. Each environment has levels of difficulties. Levels are organized according to the complexity of concepts to be learned. A way to determine complexity is by the level of discrimination (i.e., pattern-matching effort). For example, there is a level, each for sounds, shapes, colors, words, and other attributes. When the player starts the game, he performs actions to move in the environment; he can move forward, backward, jumps or interact with objects. When the player interacts with an object at a given level the object responds with the level-related concept. At the end of each level of each environment the player is assessed on concepts just explored. Hints are provided in sound format to guide the player in the game.

4.4.2 Operating Environment

- The system will be running on laptops or any PCs.
- The system will be running on iPhone/ iPad/tablet, or any 3G, 4G smart phone.

4.4.3 User Interface Storyboard

“A picture is worth a thousand words.” This statement is well recognized and it aptly applies to GBL. Game storyboarding is one of the major parts when building a game. It is necessary to create a storyboard before developing the prototype and building a game. It is useful in order to elaborate details of the goal, develop the idea and write the game script. Visualizing the main idea by creating the game storyboard provide a clear and comprehensive of the model. A game storyboard is a sequence of drawings that represent the different scenes or the different levels of the game. Designers use storyboard to sketch characters, ideas, scenes and their ordering [33]. As figure 4.11 shows, the first idea is drawn on a paper storyboard. Through brainstorming and refinement, further ideas are captured on the storyboard. Figure 4.12 displays the storyboard for part of our GBL model.
Figure 4.11: Initial Storyboard

Figure 4.12: User Interface Storyboard
4.4.4 Requirement Specifications

After validating the paper prototype, the requirements of our model were elaborated. The main functionality is making the game interactive which can encourage the child to play, discover and learn more. The player will be able to navigate through an environment and search for objects and listen to related sounds. In addition, players will be able to test their progress in learning while playing the game.

Use Case Diagram

In our model, as figure 4.13 shows, the use case diagram identifies the types of actions the learner can perform.

![Use Case Diagram](image)

Figure 4.13: Use Case Diagram of the Model
Functional Requirements

Related to the use case diagram, a set of functional requirements is developed. These are:

- FR 1. The game shall allow the player to start the game.
- FR 2. The game shall allow the player to exit the game.
- FR 3. The game shall allow the player to choose one of the four available environments; hospital, desert, mosque and farm.
  - FR 3.1. Each environment has two levels.
  - FR 3.2. The initial environment for the game scenario will be the player home.
  - FR 3.3. The game shall provide several optional environments.
  - FR 3.4. The player shall select one environment at a time.
  - FR 3.5. The player shall be able to move another level.
  - FR 3.6. The game shall allow the player to listen to songs.
  - FR 3.7. The player shall see story and listen to songs.
- FR 4. The game shall allow the player to move the character such as; move forward, move backward and hit the object.
- FR 5. At the end of each level the game shall provide quiz which sets of 5 questions.
  - FR 5.1. The game shall display questions related to each level concept.
  - FR 5.2. The player moves to the next level when passing 3 questions.
  - FR 5.3. The game shall give the player three chances to repeat the quiz in failure if he/she answer less than 3 questions.
  - FR 5.4. The player shall earn points when he/she answer right.
  - FR 5.5. The game shall repeat the level if player exceeded passing chances.
• FR 6. The game shall have sound.
  – FR 6.1. The game shall have a background sound.
  – FR 6.2. The game shall feedback and guide the player.
• FR 7. The game shall maintain the player’s score.
• FR 8. The system shall maintain the player’s level.
• FR 9. The system shall provide sound for all objects in each environment.
• FR 10. The system shall display graphics.

Non-Functional Requirements

The non-functional requirements for this model are:

• NFR 1. The game shall be available 24 hours.
• NFR 2. The game speed shall be less than 2 milliseconds.
• NFR 3. The system will be built using Game Maker.
• NFR 4. The system graphics will be designed using Adobe Photoshop.
• NFR 5. The application will be running in: Windows and Smartphone.
• NFR 6. The GUI will be designed using Photoshop.

4.5 Prototype Implementation

Implementing game-based learning is a multi-faceted activity. Game designers must consider the many facets, such as accessibility, platforms, connectivity, and cost [24, 19, 32]. In our case, the driving concern is to provide the player capabilities to learn while interacting with objects in environments that contribute to engagement and knowledge acquisition. The construction of inviting environments is critical to achieve these goals. Typically, game development is an iterative process that requires successive play testing and refinement until the
desired balance is achieved. Our description is limited to the first iteration of the prototype. First we develop the structure shown in figure 4.14 to form the basis for implementation.

![Figure 4.14: Aspects of the Game](image)

This structure reflects the concepts supported by Game Maker Studio, the game engine used to build our game. The major resources required by Game Maker are the background, sprites, characters, objects, and sounds. An object in the game is an active entity capable of highly sophisticated animation and behavior. Each object has a name, set of pictures, a set of actions, and sounds. The set of pictures is used to animate the object. The set of actions is used to associate behavior with the object. The sound allows the object to emit sounds, music, or speech.

The screen is a welcome screen. A voice welcomes the player and guides him through the selection process.

The player is then able to choose a sub-environment such as desert, hospital, mosque or farm to start navigating inside it and learning from its objects.

The initial environment is home. At this stage the player is able to hear a story to learn what he should do before leaving home and learn the duaa of leaving home. The game gives the player the chance and time to repeat duaa.
On his trip, the player learns the proper way to be a responsible passenger. Also, the player learns the duaa of embarking on a trip and repeats it.

In the player selects the hospital environment, the corresponding scene is displayed and the player enters the hospital to explore the interesting elements of this environment.

The player enters the farm by selecting the farm scene. A full view of the farm displayed. In this prototype, the exploration of the farm representative of what a complete
implementation would provide.

In this scene the player will hear a song story about the animals of the farm to learn their names and sounds.

The player will be able to navigate through the farm. Navigation will be by moving the cursor which will change the view of the scene. The player navigates inside farm and touches an animal to learn its sound.
After the player learns the sounds and the names of the farm animals, deeper knowledge conveyed as a story about a given animal is explored.

The player will learn more about the cow by Listening to a Story.

At the end of level one, the player is assessed by answering questions to allow him to go to the next level.

The game will give the player feedback about his answer and guide them through the
4.5.1 Tools

In term of implement the model, we used the following software as 4.27; Game Maker Studio, Adobe Photoshop CS6, Adobe Illustrator CS6, Windows Environment and Voice Changer. Our model will be implemented using Game Maker Studio, The Game Maker Studio is a platform which easy to use Drag-and-Drop interface of action icons that allow the user to
create own games. Also, the user is able to import and create images and sounds to use in objects. The Game Maker Studio has a number of tutorials and demos which you can import and use it. As 4.28 shows the Game Maker consist of; sprites, sounds, background, paths, time lines, objects and rooms. In Game Maker we assign images (sprites), timelines, sound and others to objects. Also, each object has properties and behavior as 4.29. And thus, all objects placed in rooms which also have a background, setting, views and objects. We have chosen Game Maker because it provides many features that are suitable for our model. The
GUI will be designed using Adobe Photoshop CS6 and Adobe Illustrator CS6, we will be
designed the images of each object and the backgrounds of each room. Last, We will be used
Voice Changer to record the sounds of the game and change it to be suitable for the child in
three years old.
4.6 Evaluation Approach

Providing alternatives to traditional classroom education, such as game-based learning, requires addressing all components of learning [45]. A critical issue is to be able to assess that
learners benefit by playing and how to carry out this assessment. Traditional testing methods
do not seem to be effective for GBL [19]. The strategy used in GBL to assess learning is
by monitoring the behavior of the learner during gameplay, the behavior of the avatar and
its physical activities (jumping, moving and so on). Analysis of the observations provide
measures of how much the player benefited from playing the learning game.

We tested our prototype model on several children of different ages (2, 3 and 4 years
old). Our observations are shown in figure 4.31. The children interacted with the sounds
and songs. They repeated the word, sound and song. The 2-year old child did not focus in the game; he played with the device and did other things. However, when the song started he listened until it finished. The 3-year old child interacted with the game and liked to play again and again. The game grabbed his attention. He liked the stories and songs and watched carefully to find out what was coming next. Also, he took the test and trying to answer to pass the level. The real-time feedback that the child got while playing encouraged him to play more. The last group (4-year old) played and interacted initially, then he skipped the first level as he was already familiar with it. We found that our current state of our game makes more sense to 3-year old children at age of 3 years than the other age groups. A summary of the children’s reactions is shown in figure 4.31.

<table>
<thead>
<tr>
<th>Age of player</th>
<th>Reaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age 2 years</td>
<td>Interact with sounds and animals only</td>
</tr>
</tbody>
</table>
| Age 3 years  | Interact with all game aspects.  
Repet the words and the sounds.  
Like to songs and repeated after the game finish.  
Want to play again and again. |
| Age 4 years  | Interact with some part of game and other basic she skip it after the first time.  
Repet the words and the sounds and follow the guides in the game.  
Like to songs and being happy with music.  
Want to play again and again. |

Figure 4.31: Evaluation Summary

We conducted a second experiment at Al-Towayya Kindergarten. We selected 100 children in KG1 between the ages of 3 and 4. All of them are at the same level and have the same background. We asked them some questions when we selected them to assess their knowledge of the concepts we introduced in our model. We selected 50 girls and 50 boys and gave each one a tablet to play the game. We tested successively 10 children at a time and recorded their responses. We also observed them while they were playing to assess:

1. How do they progress through the game?
2. Do they follow the directions of the game?

3. Do they show interest in playing with the tablet?

4. Do they look happy or bored?

5. Do they remember what they experienced after they finished playing?

6. How did they answer the questions in the game?

7. Is the content appropriate for them?

8. Does the game seem entertaining?

![Figure 4.32: Summary of Experiment Results](image)

We asked the pupils several questions about the game, such as:

1. How much they like it?

2. Is it better than what they usually do in class?

3. Where the objects they saw in the game hard to recognize?

The analysis of their responses is summarized in figure 4.32. We found that approximately 80% of them remember what they discovered inside the game. Besides, around 75% understand the game without any help easily. Almost 80% of the children applied the guides
and follow what the sound guide said inside the game. Moreover, 87% of the children analyzed the game concepts and understand the goal clearly. Also, 87% enjoyed and liked to play and about 80% were interactive with the game actions and what happen in each setting. The chart (figure 4.32) shows the high percentage that our model get while the children of the KG level 1 using it to learn in the classroom.

In the future, we will seek agreement from the schools to be able to set up a formal experiment. Such an experiment will require two groups selected randomly. These two groups must be at the same level and have the same background. One group will use the game and the other will follow the usual instruction. A pre-test will be administered to both groups. After a run of the experiment, a post-test will be given to both groups. A statistical analysis will be carried out to determine the impact of playing the game. The basic idea of the analysis is to find the difference in the means of the two groups before and after the experiment.

4.7 Conclusion

The main aim of this model is to give the player an opportunity to learn the Arabic language through entertainment by acquiring new concepts and relationships. The main task of this chapter was to explain how GBL can be modeled to support linguistic skills acquisition. First, we identified the components of games and learning. These are: learning content, structure of the learning content, presentation of the learning content, feedback, assessment. Moreover, game play, story, challenges, decision making, presentation of the game are the game components. Our game-based learning model consists of several components which are: concepts, learning process and game mechanics. We also described the structure of the game. Game storyboarding is one of the major parts when building a game. Finally, we reported on a small experiment to evaluate the effectiveness of our model.
Chapter 5: Conclusion

To address the issues of effective game-based learning, we identified the major dimensions that contribute to the integration of games and learning. Thus, we investigated the state-of-the-art of Arabic educational games and KG Arabic curricula. We summarized existing research on the Game-Based Learning design factors, and discussed the attributes of game-based learning. Developing game-based learning requires a systematic approach towards first a deep understanding of the learning process, and then, identifying and structuring the learning content to support learning and fun. The literature on game-based learning proposes a large number of concepts; however, no operational design is advanced, leaving the ideas at an abstract level further away from implementation. Our research established a framework and developed a model to support the implementation of game-based learning. In what follows we summarized our achievements.

Our first task was to delimit the notion of game-based learning. An analysis of games, their purposes and their functionalities allowed us to synthesize a definition of games and game-based learning. We surveyed and described major concepts and attributes associated with games. We carried out a survey of students to assess their perceptions of the importance of attributes that make games enjoyable. Then, we explained what is learning from games and identified game genres. Moreover, we investigated attributes that make games enjoyable. Finally, we summarized the advantages and disadvantages of game-based learning.

Given that our research targeted game-based learning for Arabic, we evaluated several Arabic educational games and summarized their major characteristics. Also, given that Arabic dictionaries are a source of language learning, we analyzed and compared English, French, and Arabic dictionaries for the purpose of discovering characteristics and features that make them effective learning resources. Another resource we sought to characterize is how learning happens in school. Thus, we completed three kinds of surveys: (1) Questionnaire for Kindergarten teachers, (2) Visit to Kindergarten, (3) Interviews with Kindergarten teachers. From these surveys, we derived some and discussed the results of our surveys. We
also reviewed the educational system in the United Arab Emirates in some detail and sum-
marized the curriculum content in use. Finally, we analyzes the curriculum model for the
kindergarten stage in Arab World and summarized our findings.

We described how GBL can be modeled to support linguistic skills acquisition. First,
we identified the components of games and learning. These are: learning content, structure of
the learning content, presentation of the learning content, feedback, assessment. Moreover,
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small experiment to evaluate the effectiveness of our model.

Finally, we elaborated a framework that captures the integration of games and learn-
ing. To demonstrate the feasibility of our approach, we implement a GBL prototype using
game technology. We described the main components of our model the structure of the game.
The prototype implementation is described. To our model, we conducted two experiments
involving hone hundred KG students at a local Kindergarten school. The results of both
experiments demonstrated the effectiveness os using game-based learning as a resource for
acquiring linguistic skills.

5.1 Further work

Even though our experiments showed positive effects, we are still left with some questions:
(1) how to validate the results? how long-lasting would the effects be? and would involve-
ment with the game ephemeral? To answer these questions, a formal experiment lasting over
a longer period of time need to be carried out. An example of experimental design would be
a random control trial (RCT) experiment extending over an entire semester. Different types
of effects and their sizes need to be measured to be able to conclude about the benefits of
game-based learning.
Another aspect that needs to be addressed is the issues associated with the learning content. Given a set of learning outcomes, the construction of the actual content or universe of concepts requires some type of process. Once defined, this content has to be organized so as to support independent learning. A by-product issue that requires fundamental research in this new context is assessment and feedback. The ensuing model must provide the capabilities to monitor and mentor the learner.
Bibliography


[26] MOE.


