

**DEVELOPING DIGITAL GAME BASED LEARNING OF
HISTORY IN SCHOOL, HYDERABAD PAKISTAN**

BY

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ABSTRACT

Technological advancements have created great impact on the human lives. People have become more prone towards technological solutions rather than the traditional ones in almost every field of life, including education. Besides just books, other multimedia-based resources are also being referred by teachers and students for effective learning. Online games and tutorials are also one way to improve one's capability and learning. Games can boost creativity and help educators remain active. Digital Game Based Learning (DGBL) is a concept where games can be used for learning purpose in classroom. This research work focuses on the classroom learning of History based subjects with interaction and fun. The main objective of the research is to design a model for the history-based games and also the development of game prototype. At initial stages, 51 components from five existing frameworks and models were identified, out of which four are generic and one is history-based model. These 51 identified components were logically grouped together within and across the framework/model and got 13 components. These 13 components were then placed in the Input Process Output (IPO) model to design the proposed model. Next objective is to develop the prototype for the game. For this, a game prototype was developed for the history course considering the curriculum of the eighth class. In order to measure the more authenticated impacts, two approaches were used for evaluation i.e. first, the experimental evaluation through the students of the course and second, the explanatory evaluation through the interviews from the teachers of the course. The experimental evaluation of the game was conducted with the students of the eighth grade in the city of Hyderabad, Sindh, Pakistan. Pretest-posttest design has been used for the experimental setup. This research design has been used in order to measure the impact of knowledge gained from traditional teacher - based approach in comparison with the proposed intervention. In experimental evaluation, class tests were conducted before and after lecture to measure the effect of both the methods. A total of 117 tests for pretest of teacher approach, 117 tests for the pretest of game approach, 117 tests for the posttest of teacher and 117 tests for the posttest of game approach were conducted. T-Tests, correlation, SPANOVA and 2-way ANOVA have been performed. T-Tests have shown the difference in the means results of posttest of teacher and game approach. The Levene's test for equality of variance gives significance (2-tailed) value of 0.08, which shows significant difference for the posttest of game and teacher approach. The test of between-subject effect gives significance value of 0.07 for the groups where $F(4,216) = 2.466$. Pearson correlation also shows significance value of 0.031 with $r = 0.21$. the correlation suggests that for the posttest in both groups there is significant difference with weak correlation, i.e. posttest in one group does not increase. These statistical tests have proven that students in the game group scored more than the students in the teacher group. For the explanatory evaluation, qualitative analysis of the interviews conducted from the teachers of history course, has been performed. It can be witnessed from the findings of this research that there has been the positive impact on the classroom learning of secondary school students. It is expected that with the use of this tool in schools, teachers can also deliver their lectures more effectively and students will gain more interest in the subject.

خلاصة البحث

أحدثت التطورات التكنولوجية تأثيرًا كبيرًا على حياة الإنسان حيث أصبح الناس أكثر ميلًا نحو الحلول التكنولوجية بدلاً من الحلول التقليدية في كل مجال من مجالات الحياة تقريبًا ، بما في ذلك التعليم. إلى جانب الكتب فقط ، يتم أيضًا إحالة الموارد الأخرى القائمة على الوسائط المتعددة من قبل المعلمين والطلاب من أجل التعلم الفعال. الألعاب والبرامج التعليمية عبر الإنترنت هي أيضًا إحدى الطرق لتحسين قدرة الفرد وتعلمه. يمكن أن تعزز الألعاب الإبداع وتساعد المعلمين على البقاء نشطين. إن التعلم القائم على الألعاب الرقمية (DGBL) هو مفهوم يمكن من خلاله استخدام الألعاب لأغراض التعلم في الفصل الدراسي. يركز هذا البحث على مفهوم التعلم في الفصول الدراسية للمواد القائمة على التاريخ مع التفاعل. الهدف الرئيسي من البحث هو تصميم نموذج للألعاب المبنية على التاريخ وكذلك تطوير نموذج أولي للعبة. في المراحل الأولية ، تم تحديد 51 مكونًا من خمسة أطر عمل ونماذج موجودة ، من بينها أربعة مكونات عامة وواحد نموذج قائم على التاريخ. تم تجميع هذه المكونات الـ 51 المحددة منطقيًا معًا داخل إطار العمل/النموذج وعبرها وحصلت على 13 مكونًا. ثم تم وضع هذه المكونات الثلاثة عشر في نموذج عملية الإدخال (IPO) لتصميم النموذج المقترح. الهدف التالي هو تطوير النموذج الأولي للعبة. لهذا الغرض ، تم تطوير نموذج أولي للعبة لدورة التاريخ مع الأخذ في الاعتبار منهج الفصل الثامن. من أجل قياس التأثيرات الأكثر مصداقية ، تم استخدام طريقتين للتقييم ، الأولى التقييم التجريبي من خلال طلاب المقرر ، والثانية التقييم التوضيحي من خلال المقابلات التي أجراها معلم المقرر الدراسي. تم إجراء التقييم التجريبي للعبة مع طلاب الصف الثامن في مدينة حيدر أباد ، السند ، باكستان. تم استخدام تصميم الاختبار القبلي البعدي للإعداد التجريبي. تم استخدام تصميم البحث هذا من أجل قياس تأثير المعرفة المكتسبة من النهج التقليدي القائم على المعلم بالمقارنة مع التدخل المقترح. في التقييم التجريبي ، أجريت الاختبارات الصفية قبل وبعد المحاضرة لقياس تأثير كلتا الطريقتين. تم إجراء ما مجموعه 117 اختبارًا للاختبار القبلي لنهج المعلم ، و 117 اختبارًا للاختبار القبلي لنهج اللعبة ، و 117 اختبارًا للاختبار البعدي للمدرس و 117 اختبارًا للاختبار البعدي لنهج اللعبة. تم إجراء اختبارات T ، والارتباط ، و SPANOVA و ANOVA-2 way. أظهرت اختبارات T-Tests الاختلاف في متوسط نتائج الاختبار اللاحق للمعلم وأسلوب اللعبة. يعطى اختبار Levene لتساوي التباين قيمة أهمية (ثنائية الذيل) تبلغ 0.08 ، مما يُظهر اختلافًا كبيرًا في الاختبار اللاحق للعبة ونهج المعلم. يعطى اختبار التأثير بين الموضوع قيمة أهمية قدرها 0.07 للمجموعات حيث $F(4,216) = 2.466$. يظهر ارتباط بيرسون أيضًا قيمة دلالة تبلغ 0.031 مع $r = 0.21$. تشير العلاقة إلى وجود فرق كبير في الاختبار البعدي في كلا المجموعتين مع ارتباط ضعيف ، أي أن الاختبار البعدي في مجموعة واحدة لا يزيد. أثبتت هذه الاختبارات الإحصائية أن الطلاب في مجموعة الألعاب سجلوا درجات أكثر من الطلاب في مجموعة المعلمين. من أجل التقييم التوضيحي، تم إجراء تحليل نوعي للمقابلات التي أجريت من قبل معلمي دورة التاريخ. يتضح من نتائج هذا البحث أنه كان هناك تأثير إيجابي على التعلم في الفصل لطلاب المدارس الثانوية. من المتوقع أنه باستخدام هذه الأداة في المدارس ، يمكن للمدرسين أيضًا إلقاء محاضراتهم بشكل أكثر فاعلية وسيكتسب الطلاب اهتمامًا أكبر بالموضوع.

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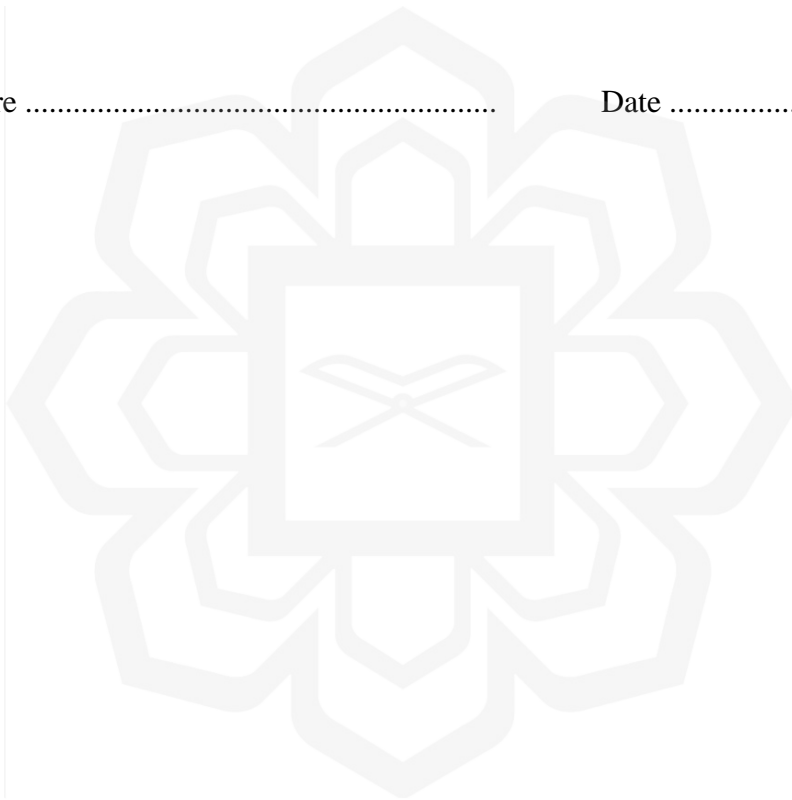
DECLARATION

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This thesis is dedicated to my late parents, because of whom I am, what I am today



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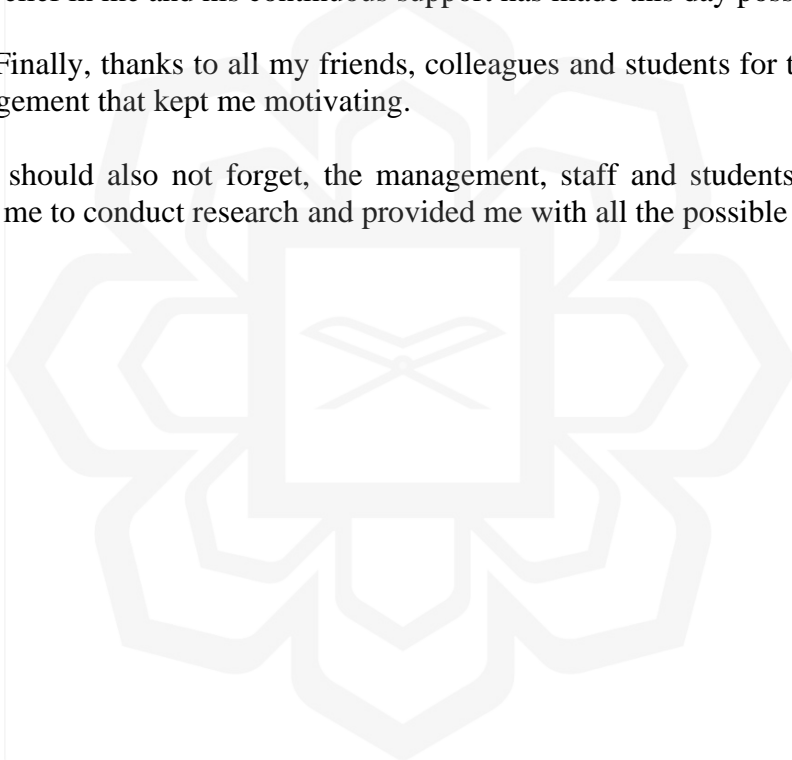


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LIST OF ABBREVIATIONS

ACM	Association for Computing Machinery
AJK	Azad Jammu Kashmir
ANOVA	Analysis of variance
CES	Clarksville Elementary School
CfE	Curriculum for Excellence
DGBL	Digital Game based Learning
DGBL-ID	Digital Game Based Learning – Instructional Design
DPE	Design, Play, Experience
DSRM	Design Science Research Methodology
ESP	Extra Sensory Perception
FATA	Federal Administered Tribal Areas
GB	Gilgit Baltistan
GBL	Game Based Learning
HMIEG	History Multimedia Interactive Educational Game
HSD	Honest Significant Difference
ICT	Information & Communication Technology
ICT	Islamabad Capital Territory
ID	Instructional Design
IDDTI	Idea, Design, Development, Testing and Implementation
IDE	Integrated Development Environment
IEEE	Institute of Electrical and Electronics Engineer
IPO	Input Process Outcome
IS	Information Systems
KP	Khyber Pakhtunkhwa
MDA	Mechanics, Dynamics, Aesthetics
NGLS	New Generation Learning Space
RQ	Research Question
SG	Serious Game
Sig.	Significance
Solomon	Social, Local and Mobile
SPANOVA	Split-plot ANOVA
SPSS	Statistical Package for the Social Sciences
TAM	Technology Acceptance Model
TPCK	Technological Pedagogical Content Knowledge
XML	eXtensible Markup Language

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE RESEARCH

In today's world, Information & Communication Technology (ICT) is becoming increasingly popular and important in terms of learning. New technologies have made the appearance of data, information, values and methods bound with different levels of interaction. These educational advancements have great impact on the field of education and training.

At present, computer games have turned out to be the most widely used activity for teenagers (Cheng et al., 2013; Stefanescu et al., 2007). Most common computer games include role-playing, real time strategy based, fighting, adventure, action and puzzle games (Cheng et al., 2013; Han & Zhenhong, 2008). Research shows that people from any age group enjoy playing games and they have proven with the passage of time, the best way to learn and gain experience (Cankaya & Kuzu, 2010; Cheng et al., 2013). Instead of just reflecting, games also help in cognitive development (Cheng et al., 2013). Therefore, computer games with educational aspect can be used as an alternative or support for effective teaching and thus learning. Subject specific games i.e. game developed with subject-matter can have applications in diverse fields such as AI, computer security, computer vision, internet search and many other for example, Extra Sensory Perception (ESP) games like agreeing on a string (Figure 1.1) and locating objects in images (Figure 1.2) (Ahn, 2006).

Ben Sawyer defined serious game as a serious business (Susi et al., 2007). Serious games or digital games are those which are subject specific, rather than for entertainment only as the impact of these games is increasingly relevant (Cuenca

López & Martín Cáceres, 2010). Such games can be used for wide areas, like government, healthcare, corporate, military, and education (Susi et al., 2007). These games can boost student's engagement and encourage a learner-centered learning environment. Video games help develop the skills, active learning, critical thinking and knowledge construction (Ellis, H., Heppell, S., Kirriemuir, J., Krotoski, A., & McFarlane, 2006; Watson et al., 2011). Table 1.1 shows the differences between entertainment games and serious games.

The impact of computer games is when people get involved in recreational and deep learning (Gee, 2003). Tang et al. in 2009 described Game Based Learning (GBL) an innovative approach that adds learning component and it depicts the usage of such digital games that holds educational value. This involves variety of software application packages, which can be helpful for learning and education in such a way that it enhances learning support, enhancing teaching pedagogy along with effective assessment and learners' evaluation (Razak et al., 2012; Tang et al., 2009). Prensky suggested the term Digital Game based Learning (DGBL) to highlight the concept digital games in GBL (Prensky, 2001). The process of learning by playing game is a constant practice which makes players reveal the underlying sets of structures and rules (Sanford & Williamson, 2006).

The idea of DGBL started out as an instructional or teaching strategy that can be made in working through computer-based applications. Through the technological advancement of learning strategies over the years, applications of DGBL can now address to various levels of learning needs.

For this research, a model for the learning of history-based games and then prototype for the game has been developed. This prototype can be used to find out the

effectiveness of DGBL approach for the class conduct of the secondary school students.



Figure 1.1: Snapshot of ESP game (Ahn, 2006)



Figure 1.2: Peekaboom, - snapshot of game (Ahn, 2006)

Table 1.1: Differences between entertainment and serious games (Susi et al., 2007)

	Serious games	Entertainment games
Task vs. rich experience	Focus is Problem solving	Rich experiences preferred
Focus	Learning elements	Fun
Simulations	Workable simulations, based on learning environment	Simplified simulation
Communication	Should be natural (i.e. non-perfect) communication	Communication is often perfect

1.2 PROBLEM STATEMENT

The approach of DGBL has widely been accepted now a days among teachers and students (Algan & Fortin, 2018; Byers et al., 2018; H.-J. H. Chen & Hsu, 2019; Fehér et al., 2018; Joe et al., 2017; Ravysse et al., 2017; Studies, 2018). Research show that still there are many subjects that needs to be considered for DGBL technique of learning. From the research gaps, it is known that History is also one of the subjects for which focus is being made.

To pursue the problem statement, this research intends to create a deeper understanding of the problems being faced by the children and teachers in history classroom. This research intends to design a model for the history-based course and to also to develop a game to enhance the learning. It creates learning more attractive and interactive. The purpose of this research is to use and evaluate the concept of DGBL in classroom learning for History based subjects that require extreme memorizing power from students.

1.3 PURPOSE OF THE STUDY

The motivation behind this research is to identify the use of DGBL approach in classroom of history-based courses. The study focused on three schools from

Hyderabad Sindh Pakistan and on viewpoint from History course teachers. If DGBL proves to be effective for the lectures of history-based courses in classroom environment, then it can be used for teaching such courses in different classes. Indeed, teachers need variety of technological tools and techniques to prepare and conduct class lectures to students to make students active and interactive instead of getting course boring or difficult. Digital technology is getting involved in educational technology, defined by Lever-Duffy and McDonald (2011) as various kinds of technological interventions are adopted by educators in class as support for in the teaching as well as learning process. The purpose behind this research study is to introduce a digital game-based learning environment for student of secondary school with the help of their teachers so students' interest for the course can be enhanced and learning could be improved.

1.4 RESEARCH OBJECTIVES

The study aims towards the construction of the DGBL model to design serious game for the children of history-based course. Following are the objectives to achieve the main purpose of the research:

1. To identify the components from existing framework and models that contribute towards the design of game-based learning in children and history-based classroom
2. To construct a DGBL model using the above identified components
3. To design and develop a game prototype to demonstrate the view of the proposed model
4. To evaluate the game prototype

1.5 RESEARCH QUESTIONS

In order to achieve the main objective of the research, several research questions (RQ) have been designed based on each research objective. Following are the research questions along with the Chapters they are answered in:

Objective 1: To identify the components from existing framework and models that contribute towards the design of game-based learning in children and history-based classroom

Chapter 2 – Literature Review & Chapter 4 – DGBL Model for History Courses

- RQ1. Which strategies and technologies are being used by teachers in the classroom?
- RQ2. What is the effect of existing technology in classroom learning, if any?
- RQ3. What are the challenges faced by the teachers as well as students in the learning of history-based courses?
- RQ4. Which components existing serious game design models and frameworks are using?
- RQ5. What are the learning theories that can be applied to facilitate students to learn history-based course?

Objective 2: To construct a DGBL model using above identified components

Chapter 4 - DGBL Model for History Courses

- RQ6. What is the basis of the construction of the model?
- RQ7. What is the structure of the framework?
- RQ8. How the components are logically grouped together?
- RQ9. How the model can be used to design a serious game?

Objective 3: To design and develop a game prototype to see the view of the proposed model

Chapter 5 – Game Prototype Development and Evaluation

- RQ10. How game prototype has been developed?
- RQ11. How the components from the model have mapped to the prototype?
- RQ12. How the game in early stage be evaluated for usability problems?

Objective 4: To evaluate the game prototype

Chapter 5 – Game Prototype Development and Evaluation & Chapter 6 – Results and Analysis

- RQ13. What criteria is used for the evaluation of prototype?
- RQ14. How is the evaluation of prototype is conducted?
- RQ15. How the result implies the study?

1.6 SIGNIFICANCE OF THE STUDY

This study intends to contribute in the learning environments that can be used by researchers or academicians to design or develop any intervention based on the results of this research study. This can be supported by the DGBL model proposed in this research. The DGBL model guides about the components and their specifications that are required for the design of game and the relationship among these components that how information flows to and from these components. The outcome forms this study, DGBL model and the game prototype can help towards the learning of school students.