Digital Game Based Learning in Business Management Education: A Step from Entertainment to Digital Literacy

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Abstract
Recent years have seen an escalating interest in the use of digital games in pursuit of educational goals. The present research also examined the impact of using digital games on learning in higher education. Female participants (N=46) from a women university in Pakistan were assigned to an experimental condition. The effect of game design with moderating effect of 3D dimension modelling, game contents and social context was examined on learning effectiveness. Results found significant impact of game design with moderating effect of 3D dimension modelling and game contents on learning satisfaction. However, results did not show a significant impact of collaboration on learning satisfaction during the experimental play session. Results are discussed in terms of the potential for higher education learning games and technology to increase students' perceived learning effectiveness. This study reinforces the use of digital games in higher education. It also emphasize the necessity of further research to evaluate the academic value of digital games in students' learning and knowledge retention.
Keywords: Higher Education, games, learning, Game Design, Game contents

Introduction

The introduction of educational technologies has been bringing tremendous changes in the landscape of education. Majority academic institutes across the world have adopted many novel forms of learning and teaching methods and tools. For example, "reference schools such as Harvard Business School have meant to make a progress, from the evolution of paper based study cases into simulations and interactive case studies where the learners' could play a realistic situation, to learning by doing" (Srikant, Garvin & Cullen, 2010 as cited in Popescu, Romero, & Usart, 2013). Digital Game-based Learning (DGBL) is one of the popular tool that has been gaining attention of researchers in various disciplines. A plethora of researchers have provided the evidence that using digital games in education can provide multiple benefits like retaining memory longer, motivation to learn, developing skills like problem solving, planning and strategic thinking etc. (Shi & Shih,2015). Learning via digital games is guided by certain rules and goals which helps learners to learn in an organized way by creating step by step real experiences which enhance interest among them and strengthen their learning effectiveness (Tsai, Yu, & Hsiao, 2010). Thus, digital games can be considered as a crucial teaching tool in future (Becker, 2007). Hence, study of effects of digital games is worthy of examination.

The merger of information technology tools into education have brought several challenges for both professions. The IT professionals and the educationist both have different frame of works. Hence, when two fields are brought together, it might hamper the intended outcomes of certain actions e.g. using digital games for learning. In order to get the desired benefits of digital game based learning, certain learning as well as technical factors of the games need to be considered. As Shi and Shih (2015) pointed out that "*Game designers are able to create interesting games but do not know how to maintain the quality of teaching materials in a game, whereas educators focused on effective educational materials but do not know how to create interesting games*" . Thus, in this study an investigation has been made to explore the factors of digital games that can affect the learning effectiveness of learner. The framework presented in this paper help researchers to create and use more interesting educational games for the intended learning outcomes.

Literature Review
Game Based Learning

A digital game can be defined as "*a rule-based system having quantifiable outcomes which are assigned to specific values ….The player spends effort to influence the outcomes in the game, and as a result, the player will be happy with positive outcomes or unhappy with negative outcomes*" (Juul, 2003). Game Based Learning (GBL) is the fusion of the two distinct frameworks i-e "digital games and learning". Prensky called learning via digital games as "*any marriage of educational content and computer games*" (2001, p. 145).

Learning via digital games provide such thought-provoking experiences that indorse the satisfaction of

the learners by offering them authentic learning (Gee, 2007; Mims, 2003). Several frameworks have been used to investigate the usefulness of games in education like Kolb's experiential learning theory, Gardner's Theory of Multiple Intelligence, constructivist theory as well as activity theory and many others.

The constructivism learning theory grounded in learning theories proposed by Dewey (1916), Piaget (1972) and Bruner (1990), assumes the self-created knowledge of learners. Woolfolk (1993, p. 485) describes it as:

> … "*The key idea is that students actively construct their own knowledge: the mind of the student mediates input from the outside world to determine what the student will learn. Learning is active mental work, not passive reception of teaching*".

The activity theory model by Engestrom's model provides and understanding of different factors that can have effect on an activity. These factors include subjects, objects, and tools, division of labour, rues and community. Both constructivism and activity theory have been used to study digital game based learning in various settings.

Learning satisfaction:

Learning satisfaction in setting of computerized recreations is really the individual's sentiments and experience of learning environment after direction, thus, it is individual's cheerful emotions or inspirational dispositions (Lee, 2008) toward digital games. Chang et al. (2009) also indicated that game based learning is an obvious and famous course, which keeps the instructive reason and enhances the capacity of player that is used to genuine living. The instructive diversion makes the learner turn into the focal point of realizing, which permits the learning procedure to be less demanding, all the more intriguing and more successful, thus, enhancing learning satisfaction of learners.

Game Design

The deliberate examination of digital game helps in comprehension hypothetical definitions of viable learning/instructing. Diverse analysts have proposed distinctive outline components of digital games.Thornton and Cleveland (1990) proposed interactivity as an essential component of digital games. Malone (1981) noted four convincing attributes of digital games i.e "challenge, fantasy, complexity, and control". A few specialists (Clark, 1985; Khalili and Shashaani, 1994) found that learners groups that utilized multimedia show high learning enhancements as contrast with conventional classroom address. As per Najjar (1996) learners give careful consideration to media that are novel to them, and therefore their consideration increments which at last enhances their level and rate of learning.

Couple of analysts found that when fantasy is incorporated into instructional substance, it prompts expand learners' enthusiasm and also learning (Cordova &Lepper, 1996). In any case, in digital games, the measure of imagination/fantasy must be viewed as all the more painstakingly (Gunter et al., 2007) in light of the fact that instructive games are more arranged towards displaying genuine circumstances and expanded fantasies may diminish its representation of reality which thusly has unsafe impact on its instructive worth (Warren et al., 2008). Hence, it has been hypothesized that

H1: Game design containing novelty, fantasy and aesthetics aspects enhances learner's satisfaction in a digital game based learning environment.

3D Dimension Modeling: Moderating Effect on Game Design and Learning Satisfaction

The digital games are outlined utilizing 2D or 3D models for speaking to true circumstance like players, weapons and so on (Kot et al., 2005).There is a questionable open deliberation in writing about the reasonableness of both measurements. A few users incline toward three-dimensional interfaces since they have the potential for novel social, logical, and business applications, hence, it is vital for planners to study users' execution and fulfillment for convincing configuration structures (Shneiderman, 2003).
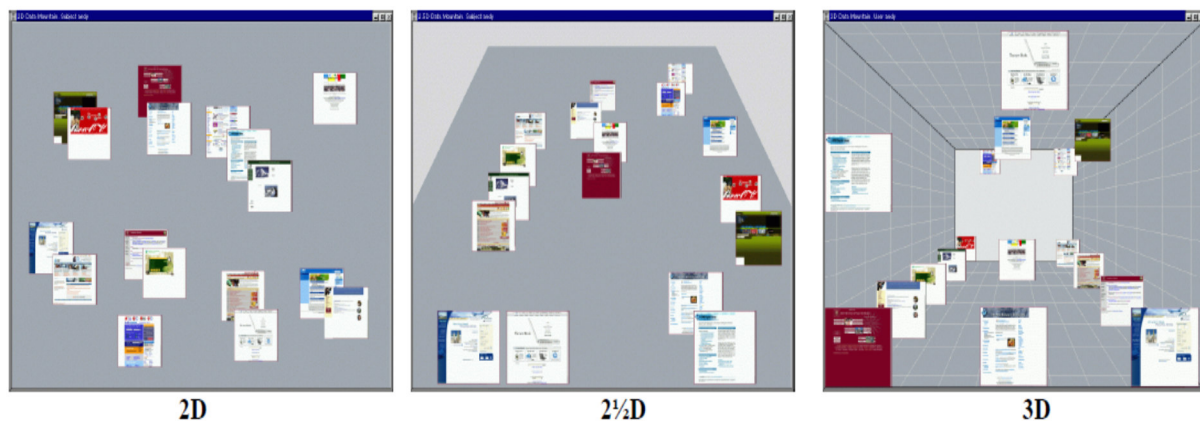

Figure 1: The three and two dimension interfaces (adopted from Cockburn and McKenzie, 2002)

Huang, Rauch and Liaw (2010) in their study acknowledged that "*there are not a lot of empirical studies or clear evidence that shows that student learning using 3D anatomical structures in VRLEs (i.e.WVBS-ATS) yields an improvement over the standard teaching modalities of text or 2D media*".

The previous literature demonstrate that a large portion of the studies looking at 2D and 3D presentations can be found in range of aeronautics and military (Cockburn & Bruce McKenzie, 2002) and there are next to no real case of 3D substance for the scholastic fields and because of this contrast somewhere around 2D and 3D in learning impacts is still not clear (Mukai, et al., 2011). Along these lines, it appears to be sensible not to disregard dimensional presentation of instructive advanced amusements, as it additionally assumes a critical part in learning. The connection of 3D and 2D show with learning can be comprehended with help of Kot et al. (2005) clarification as appeared in figure 2. They clarify that product perception utilizing 3D design perform information encoding and disentangling. In the main phase of information change, data is encoded in appropriate structure for perception or presentation. The resultant presentation in game or PC is decoded by client. Here, encoding and translating relies on in plain view traits like amusement style inserted in innovation of 3D/2D interface. The interpreting of showcase (learning) by client relies on right and productive show and utilization of 3D or 2D interface impacts it. Therefore, it can be contended that 3D measurement demonstrating reinforces the impacts of game design components on learning satisfaction. Hence, it has been hypothesized that

H2. 3D dimension modeling has a moderating impact on the effect of game design elements on learning satisfaction in a digital game based learning environment.
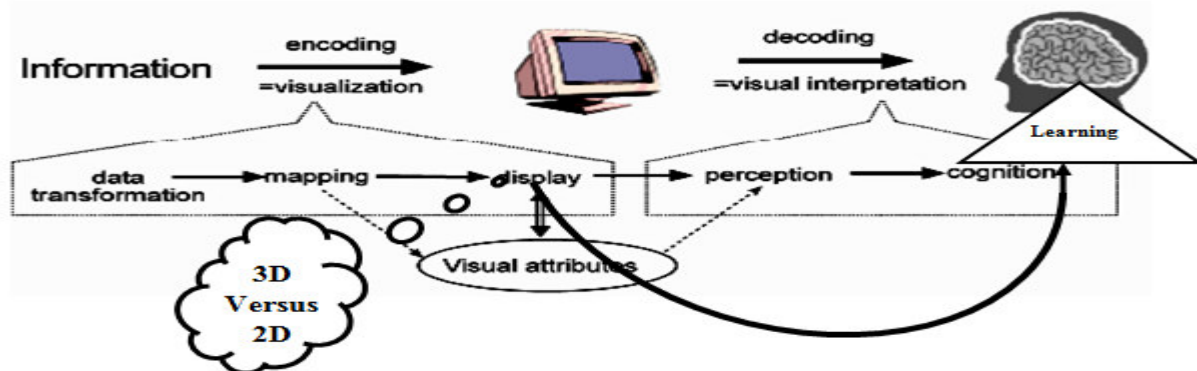

Figure 2: The Visualization Pipeline (Adopted from Kot et al., 2005)

Game Contents

Motivational analysts have recommended taking after qualities regular to advanced learning games "namely challenge, curiosity, fantasy, and control" (Malone & Lepper, 1987). Challenge in a computerized game is the sorts of issues introduced over the span of playing game. As indicated by Clark (2007), a perfect measure of difficulties in game brings consideration and more profound learning on the grounds that overcoming challenges brings a feeling of addition for learning. In this way, challenge in game is important for learning satisfaction.

As indicated by Andresen and Ahdell (2001) game contents must be important for the client, regarding topicality and in addition the game contents must be of good quality. They assist contended that the client needs to learn something for all intents and purposes, and if game contents are not esteem included and pertinent, it would make hard to make a viable learning circumstance. In this way, value added contents emphatically influence learner's learning satisfaction. Standards/rules of play are additionally critical substance of compelling computer games (Zagal, Nussbaum and Rosas, 2000) "*Rules are what differentiate games from other kinds of play…. If you don't have rules you have free play, not a game*" (Prensky, 2001, p. 119). Hence, it has been hypothesized that

H3: Game contents characterized by challenge, rules, and value positively affect learners' satisfaction in a digital game based learning environment.

Learning in Social Context

Researchers advocate the social connection of learning (e.g Bransford, Brown, Cocking; 1999). The social learning hypothesis additionally affirms that learning is social in nature which includes connections among individuals. The collective learning offers the advantages of expanding enthusiasm among learners and advancing basic considering (Dimitropoulos et al., 2008), subsequently "shared learning style challenges a gathering of learners to take care of issues cooperatively among themselves" (Huang, Rauch and Liaw, 2010).

Swan et al., (2000) additionally found that learners who experienced high state of connection with cohorts

evaluated their large amounts of learning. In this way, learning satisfaction is additionally influenced by the coordinated effort happens among player/learners in a digital game based learning environment. Hence, it has been hypothesized that

H4: Perceived collaboration by learners in a digital game based learning environment enhances learning satisfaction

The proposed research model is shown in figure 3
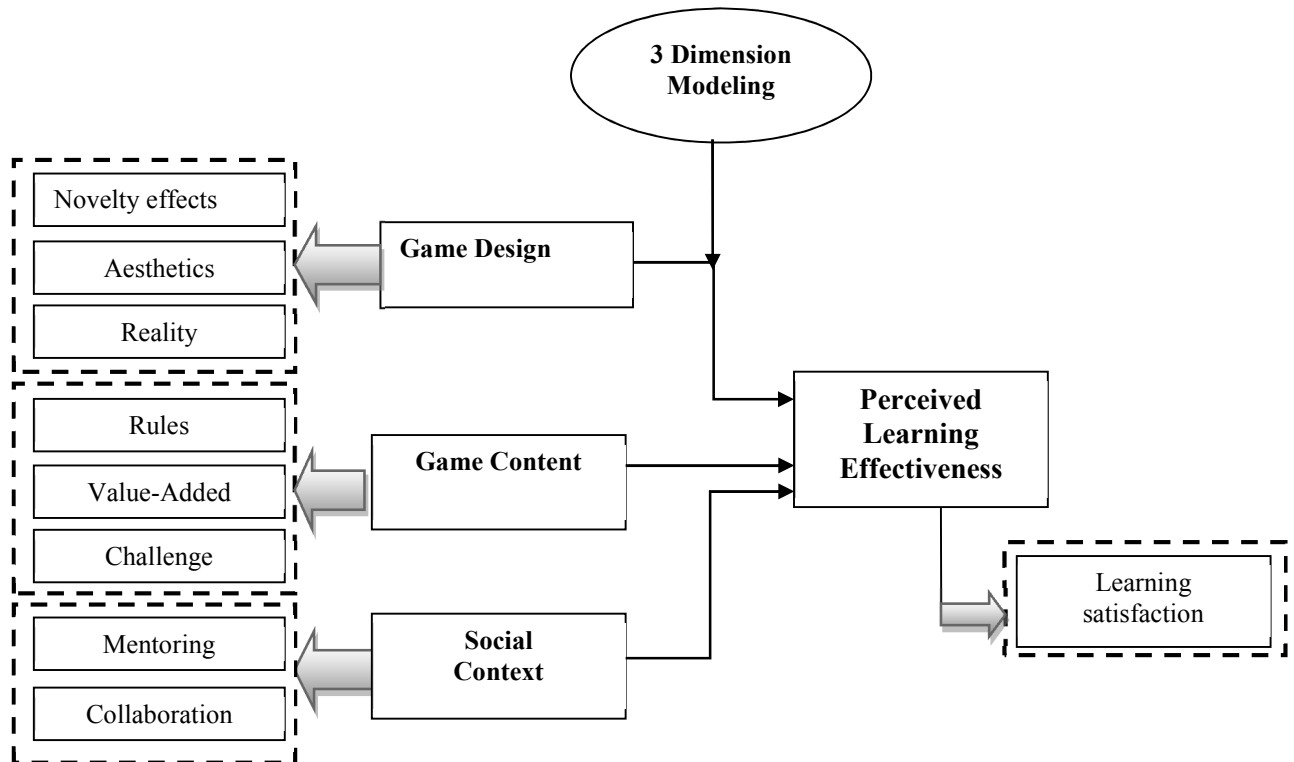
Fig 3: Proposed Research Model for Digital Game Based Learning

Research Design and Methodology

A Quasi-test study was led to research the game based learning in advanced education. This trial study was led with the understudies who joined fifth semester of their BBA Honors degree (Bachelor in Business Administration) and who were embraced a class of Operations Management subject. Subsequently, the study was set with regards to a center Business Education educational programs subject. To be incorporated into the study, understudies ought to have effectively finished the early on classes of Operation Managements and particularly the subject of Project Management and must be capable in PC utilization. Preceding their enrolment, all understudies who took an interest in the study were educated of the reason and methodology, after which all demonstrated their eagerness. As indicated by Maguire, Elton,Osman,and Nicolle (2006) "the general trial outlines of studies assessing amusements based learning are test rather than semi trial and are frequently in view of pre-test/post-test approach" (as refered to in Connolly, Stansfield and Hainey, 2011). As this particular study is worried with the assessment of states of mind of understudies towards genuine amusement, consequently it would not have been attainable to have set up numerous control bunches (Connolly, Stansfield and Hainey, 2011), subsequently, the test plan utilized for the study was Game/post-test.

Sample

Students were randomly assigned to these groups. A total of 46 students were recruited from two classes of the same subject. The student profiles were similar to each other. They were at the same state of educational, gender and age range. As the university selected was a women university, hence, all the participants were females. Subjects were provided with continuous assistance and support for queries throughout the game session. Along with it, subjects were allowed to share and discuss with each other the progress and scores. In short, game was played in a social collaborative environment.

Procedure

The game was tried amid the Operation Managements course at a public sector University from January 2014 to

June 2014. For this trial plan, there were two classes of understudies who were allotted to the Game/post-test exploratory configuration. Preceding their genuine communication with the game, the subjects were given brief oral guidelines on its utilization by the analyst. All through the mediations, the researcher additionally watched understudies' association with the applications furthermore given procedural help to the understudies. The game session was led in the classroom where every member was situated before a laptop. The researcher provided a wi-fi gadget to give them web association, as the game was to be played on the web. After the fruition of the game session, in an ensuing showing hour, the subjects filled questionnaires.

Instrument
For the motivations behind the examination, a likert scale survey was developed comprising of two sections (demographical variables like gender, age, PC gaming knowledge for learning), (b) a posttest Questionnaire about the subjects' states of mind and conclusions. Since the acceptance of the instructional impact of utilizing amusements was the principle target of study, pilot test was overseen. Subject specialists were included in completing pilot testing to guarantee legitimacy and unwavering quality of the questionnaire. All variables were evaluated on 5 point Likert scale where 1 depicts "strongly disagree" and 5 for "strongly agree. Survey contained two sections. This study received the measures used to operationalize the builds from the past writing, rolling out minor wording improvements to tailor these measures to the amusement based connection. The survey things were refined with the help of subject specialists, in this way, guaranteeing its substance legitimacy and ensuring its content validity. The game selected for the study was My Sust House.

Results
The tool used to measure learning effectiveness in this study is perception based measurement which consists of opinion survey. Questionnaire designed on five point likert scale was used to gather responses about the game based learning. The proposed research model for game based learning was tested at this phase. Regression analysis was used to confirm the theoretical relationships among variables. After completion of game playing, participants were asked to complete the opinion based questionnaire about this digital games learning session. First part of the questionnaire contained background information of the respondents including age, gender and previous learning experience. According to Table 1, the participants were all females who never played games for learning in classroom settings. The age range of all respondents was between 20 to 23 years.

Table 1:
Descriptive statistics of different background variables

Background variables	Responses	Frequency
Gender	Female	46
Age	20-23 years	46
Experience with DGBL	No	46

The main purpose of this study was to examine the effect of digital games on learning effectiveness in higher education. For this, the results of an experimental study are as follows. Table 2 shows the statistical values of correlation, cronbach alpha, mean and standard deviation. The statistical values show positive correlation among all variables. The highest correlation (.737) was found between social context and game design, while the lowest (.256) correlation was found between 3D dimension and learning satisfaction. The value of Cronbach alpha which is a measure of scale reliability, confirm the reliability of overall scale (α=.830). The lowest alpha was found of social context (α=.642). Thus, overall the statistical values suggest that the scale items have relatively high internal consistency.

Table 2
Cronbach Alpha, Mean, Standard Deviation and Correlation

|	1	2	3	4	5	α	No of Items
Game Design	1					.822	5
Game content	.714**	1				.859	9
Social Context	.737**	.600**	1			.642	6
satisfaction	.384**	.477**	.342*	1		.796	3
3D Dimension	.379**	.320*	.314*	.256	1	.831	3
Overall Scale α						.830	
M	1.82	1.76	1.83	1.52	1.84		
SD	.564	.399	.400	.924	.569		

In order to investigate the hypothesized relationships among variables, multiples regression analysis using SPSS 19 was performed. The results of regression analysis are shown in table 3.

IISTE

Table 3
Regression Analysis

		β	t	Sig	R	R²	F	Sig
	DV: Learning Satisfaction							
	Step 1 for H1							
IV	Game Design	.630	2.762	.008	.384	.148	7.267	.003
	Moderation (H2)							
	Step 1							
IV	Game Design	.550	2.224	.031	.402	.162	3.280	.003[b]
IV	3D-Dimenion	.209	.854	.398				
	Step 2							
IV	Game Design	-.639	-.627	.534	.436	.190	4.155	.002[a]
IV	3D-Dimenion	-1.02	-.971	.337				
	Moderator	.759	1.201	.236				
	Steps for H3 & H4							
IV	Game Contents	.982	3.599	.001	.477	.227	12.953	.001
IV	Social Context	.202	2.418	.020	.342	.117	.525	.602

N=46, IV is Independent Variable; DV=Dependent Variable

A hierarchical regression was performed whereby predictor variables are entered in a series of steps. Hierarchical regression is the standard way to test for moderator effects. In order to test hypothesis 1, the effect of games design as independent variable was examined on learning satisfaction as dependent variable. The statistical values (β=.148, R^2 =7.267, F=.630, p=.003) in table show that game design has significant and positive effect on learning satisfaction among students who play digital games. In the second step, game design and 3Ddimesnion both were entered. The statistical values of game design (β= .550) and 3Ddimesnion (β= .209, R2= .162, F= 3.280, p=.003) confirmed their combined effect on predicting learning satisfaction. In the third step, game design, 3D dimension and interaction term between them were entered into the regression. In this step, the interaction term explained a significant variance in learning satisfaction, ΔR^2 =.190, *F*= 4.155, *P*= .002. Thus, 3D dimension was found to be a significant moderator of the relationship between game design and perceived learning effectiveness.
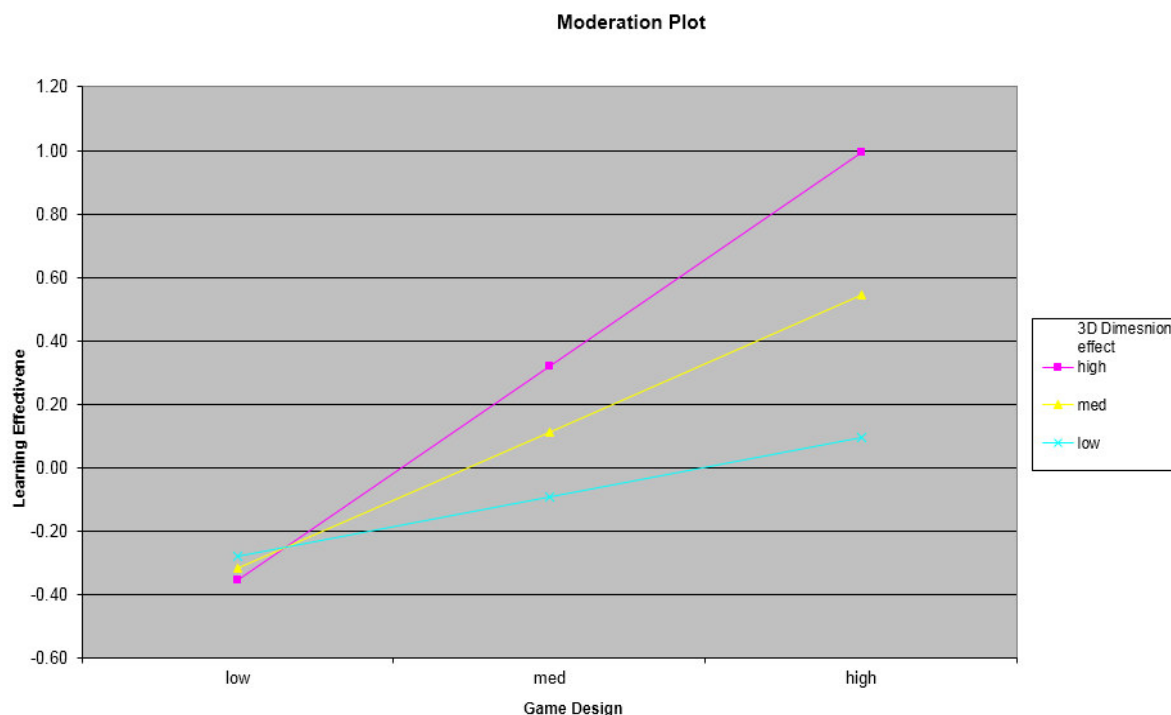
Fig 5: Moderation Plot

Figure 5 presents the relationship between Game Design and Learning effectiveness at high (z=1), medium and low (z=-1) levels of 3D dimension effect. These equations were derived from the standardized beta values. According to this figure and statistics, introducing 3D dimension modelling effect as moderator increases the predictive power of the model by enhancing the effect of game design on learning satisfaction.

The effects of other independent variables of the model i.e game contents and social context on learning

effectiveness were also measured. The statistical values show that there is a strong positive association (β=.982, p=.001) between game contents and learning effectiveness. Similarly, the results also show a positive association (β=.202, p= .020) between social context and learning effectiveness, however, this relationship is not significant in this case. Hence, in this study, no statistically significant linear dependence of the learning effectiveness on social context of learning was detected.

Discussion and Conclusion
This study aims to provide the answers to the questions of extent to which digital games enhance students' learning effectiveness in higher education as well as the importance of certain elements such as game design, game contents and social context in facilitating the digital game based learning. The results confirmed the effect of game design elements including 3D dimension effect and game contents on learning effectiveness of students. This result is consistent with previous study (e.g Su and Cheng, 2013; Niedenthal, 2009; Longstreet and Cooper, 2011). Surprisingly, the effect of social context on learning effectiveness did not show the significant contribution in explaining learning effectiveness in higher education. This is an important finding of this study, as previous researches and theories such as Socio-culturism approach of learning emphasizes that context around the learning situation is important for effective learning. The positive but insignificant impact of social context on learning effectiveness in digital game based environment confirms that there are still valuable lessons to be learned, as learning via games in a social context in higher education does not guarantee perceived learning effectiveness or learning satisfaction.   This aspects needs to be further explored and re tested in future studies.

These findings are specifically consistent with a study conducted by Berns, Gonzalez-Pardo and Camacho (2013) who presented recent experiences with the design of game-like applications in 3-D virtual environments and their impact on student motivation and learning. They found that "virtual environments combined with specific videogame features could enhance student motivation towards online learning and bridge the often emerging gap between the online and face-to-face teaching and learning process". However, their study also found that collaboration with others increase their motivation, which could not be proven significantly in the present study. The results of the Pearson correlation among the variables also revealed a significant and positive association. All the analysis drawn from this study data suggests that blending an interactive game-based approach with traditional classroom delivery increases learning effectiveness in higher education.

As a conclusion, for the most part game based learning was seen emphatically by the learners in business management education. Generally speaking, the proof gathered from this study seemed to demonstrate that the utilization of computerized game in business education gave a possibly helpful instructive stage for propelling understudies to learning. The outcomes exhibited in this strengthens the utilization of computerized games in advanced education. It likewise stress the need of further research to assess the scholastic estimation of digital games in understudies' learning and information maintenance. Subsequently, it is presumed that computerized games can be viewed as a promising apparatus for learning in advanced education. The study gives the best approach to boost the effect of a digital game, by giving a comprehension of how the gaming and learning can immaculately be fused and how the game based learning is evaluated by learners.

The findings of this study add to the observational writing on game based learning particularly in business education. The study is likewise huge on the grounds that its findings will comprehend the capability of games for giving intense learning situations to change the scene of instruction. The study won't just add to the learning adequacy additionally will give clue about social change in current teaching method setting. The social change is conceivable on the grounds that the mindfulness and understandings of computerized games by students may expand its interest as supplementary instrument of learning and educating. This can bring open door for distributers who could consider games as requested part of course book and educational modules material.

The findings of this study in connection of business and higher education organization may give an aide approach to strategy creators, and overseers to amend the current instructive arrangement. The outcomes can likewise game designers to make more intuitive substance to enhance the games plans and substance. In spite of the fact that the study gives valuable experiences into game based learning in advanced education, it is still not free from limitations. The significant confinement of this study is the consideration of female university students enrolled in a specific course. Future analysts could extend the investigation to different colleges and courses across various disciplines. .

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