A Study of Supplementing Conventional Business Education with Digital Games

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ABSTRACT

This paper documents how the adoption of digital games by academia reshapes the current worldview by bringing the potential answers for all learning issues. The central objective of this study is to investigate the extent to which digital games can impact learning effectiveness, and to what extent these games can be used as supplementary elements for existing pedagogical methods prevailing in Pakistan. The study used experimental research method to investigate the effects of digital games on learning outcomes of students in business education in Pakistan. The statistical analysis was done using Partial Least Square method with the help of SmartPLS Software. All results confirmed that students in higher education sector are ready to accept and adopt new technologies that can better facilitate their learning process. They are ready to create and share their knowledge in a collaborative manner by using technological platforms.

Keywords

Experimental research, Digital games, Business education, Satisfaction, Performance, Instructors' support

Introduction

"If we teach today's students, as we taught yesterday's, we rob them of tomorrow" - John Dewey (1915)

Technology in education has been on upsurge during recent years. The modern advancement in educational technologies has given different opportunities to educational establishments for embracing new types of learning. The improvement of effective learning in a computer or technology mediated learning environment is an exciting challenge. The major challenge postulated by the technology in education is that students who are born in this computerized and versatile digital age participate in learning from an exceptionally assorted point of view than their forerunners (Pollara, 2011). These types of students were called by Prensky (2001) as "*'digital natives,' who are at low compatibility with faculty called as 'digital immigrants'.*" The low compatibility between the teacher and students brought by new educational technologies, stresses a need for revising the existing pedagogical strategies so that learning outcomes of the students can be enhanced.

Pakistan has lagged the world in adopting the educational technologies as the use of innovative tools in education are at their infancy. For this country, where there are not many learning advancements, studies exploring the potentials of technologies in education are crucial. Hence, this study has tried to investigate the extent to which new learning technologies can influence learning adequacy in Pakistan and to what degree these advances can be utilized as supplementary components for the existing teaching strategies. For this purpose, digital games have been tested in business education studies in a university setting. The study was planned to investigate the effects of digital games on learning satisfaction and perceived learning performance of business graduates with moderating role of instructor support.

Literature review

Digital games in education

Majority academic and professional institutes have identified the need for new forms of learning, beyond traditional learning and training methods. Among these new forms of learning or teaching methods, Digital Game-based Learning (DGBL) has been gaining popularity and attention (Rondon, Sassi & Andrade, 2013). This Digital Game-based Learning has been considered as a different instructional method to increase learning which cannot be addressed by the traditional lecture-discussion instruction. The digital games are not only interesting for children but for teachers and researchers as well due to their rich features representing a real environment (Squire, 2002). Researchers and developers are trying to explore new ways to exploit the interactive

potential of digital games in the learning environments within the boundaries of psychological and philosophical beliefs about learning process (Hannafin, 1992). However, the effectiveness of digital game based learning still needs clarification and validation for generalizability.

Games containing educational objectives are thought to be helpful, more interesting, and, thus, more effective in the learning of academic subjects (Popescu, Romero & Usart, 2013). For this reason, academic world has been trying to provide personal learning environments (PLE) by introducing new technologies like games (Gåsland, 2011). 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). Many researchers have been using different research designs and theoretical frameworks for explaining and measuring digital game based learning. Although these studies have provided enough evidence about the effectiveness of digital games in learning, there do not exist sufficient facts about such games in higher education (Ozcelik, Cagiltay & Ozcelik, 2013).

Despite many premises about the benefits of digital game-based learning (e.g., Steinkuehler, 2008), little empirical evidence exists about the effectiveness of such games in higher education as the existing studies do not adequately address the relationships between integrating digital game-based learning in a university curriculum and students' learning. Although, success of serious games has been shown in many recent studies (e.g., Hwang & Wu, 2012; Wouters et al., 2013), the *real prospective of these games in education is "still far to be fulfilled, concerning higher-order learning goals*" (Connolly et al., 2012) and "*there is a growing need for educational technology research in this field"* (Bellotti, Bottino, Fernández-Manjón & Nadolski, 2014).

Activity theory

Activity theory is a psychological and multidisciplinary theoretical framework that has its roots in the Russian psychology. The original framework of this theory was developed by the Russian psychologist Aleksei Leontiev (Leontiev, 1978). Engeström (1987) further illustrated six components of this triangular structure of an activity system namely *Subject, Object, Tools, Community, Division of Labour, and Rules.* The assumption of this theory is based on interrelationship of the subject (the learner), the object (the goal which leads to the outcome), and the tools (both physical and conceptual) used to mediate between them. Activity theory conceives that activity system (e.g., family, a religious organization, a political movement, a course of study, a school, a research laboratory) is the basic unit of analysis of behaviour in individuals or collective. It argues that the relationship between objects in the environment and people are intervened by culture and its rules, the community, and by labour and its roles and development. The central part of activity theory is the hierarchical framework of activity that is composed of: *activity, actions* and *operations,* characterized by *objective, goals and conditions*, respectively (Leont'ev, 1981).

Activity theory developed decades ago has been widely used for explaining human computer interaction. The activity theory offers a comprehensive framework when information technology is used in higher education for students and teachers (Hashim & Jones, 2007). Activity theory has been applied to games (Dobson et al., 2005; Squire, 2002), and has been studied in the context of players' learning. Oliver and Pelletier (2004) using activity theory, designed a framework that facilitates the tracking of learning without disturbing the natural flow of game play. The game playing process in digital game based learning environment enhances the learning by allowing players to acquire learning experiences in games, encouraging interactions between learners and the game system as well as situating learners in complex learning environments (Pannese & Carlesi, 2007). The game playing processes are interesting to play (Huang & Johnson, 2009), thus promote meaningful learning.

Learning satisfaction

Tsai, Yu and Hsiao (2012) investigated the factors that enhance learning effectiveness in digital game based learning environment. They found that learning motivation, learning ability and playing skills are direct determinant of learning effectiveness in digital game based learning environment. Kelle, Klemke and Specht (2013) in an experimental study, found strong support of design patterns for learning games on the learning outcome and user experience. Yien, Hung, Hwang and Lin (2011) in a quasi-experimental non-equivalent-control group design found positive effect of game playing on learning achievements and learning attitudes of students in nutrition education. Liao and Wang (2011) investigated students' usage of business simulation games and its effect on their motivation, satisfaction and intention to use. They found satisfaction as a significant

determinant of continuous usage intentions, hence, satisfaction must be monitored in game-based learning contexts. Therefore, it can be hypothesized that:

H1. Use of digital games for learning significantly affects perceived learning satisfaction of the students.

Perceived learning performance

Ariffin, Oxley and Sulaiman (2014) defined learner performance as "increase of knowledge and capability of learner as a result of learning activity." They evaluated the effectiveness of using digital games for learning in higher education and found that a student's background affects his motivation to learn which in turn affects his performance. Zafar, Mueen, Awedh and Balubaid (2014) explored the relationship between using computer games and students' academic learning performance. They used a game based learning with native language hint and found that students using games for learning performed better than those who did not. They also highlighted that students' enjoyment while playing games significantly affect their learning performance. Hence, it can be hypothesized that:

H 2: Use of digital games for learning significantly affects perceived learning performance of the students.

Learner interest

Li (2010) discussed that "game motivation" encompasses four concepts i.e., interest, anxiety, probability of success, and challenge. The game playing process in digital game based learning environment enhances the learning by allowing players to acquire learning experiences in games, encouraging interactions between learners and the game system as well as situating learners in complex learning environments (Pannese & Carlesi, 2007). The game playing processes are interesting to play (Huang & Johnson, 2009), thus, promote meaningful learning. Farrell (2005) demonstrated a learning environment, including simulations, in an international business course and argued that simulations having participative, inductive, interactive, reflective, and exploratory characteristics along with traditional pedagogical methods stimulate a student's interest and engagement to achieve the expected learning purposes. Therefore, interest has been taken as a mediator between digital game play and learning outcomes in this study. Hence, it has been hypothesized that:

H 3(a): Learner's interest mediates the effect of use of digital games for learning on learning satisfaction of the students.

H 3(a): Learner's interest mediates the effect of use of digital games for learning on perceived learning performance of the students.

Instructor support

The chore of incorporating games into an instructive setting is a challenging one, which requires instructors to arrange many organizational resources. "Beyond the practicalities of ensuring that game sessions run reliably from an administrative perspective, the teacher also needs to be able to guide and support students' gaming experiences during activities. Being a game tutor for students entails several responsibilities for the teacher, and given the variation in individual students' proficiencies and interests, this task can be rather difficult……game-based learning processes are demanding on teachers, requiring them to take on many different roles, each of which requires a specific skillset" (Marklund & Taylor, 2014).

Taylor (2015) addressed the issue of instructor role in game based learning environment. She said that in game based learning literature, focus has been made solely on game characteristics and teacher's role has been overlooked. However, instructor-led serious gaming requires many roles such as facilitator, debriefing role, and coach or in-game organiser, player/participant, off game enabler, leader, expert, and technical support. Needs for the teacher's roles should be effectively met for the smooth running of serious gaming (Taylor, 2015). McDaniel and Telep (2009) found that "*students may be enticed by the thought of playing a video game as one of their assignments, but unless instructors provide a clear and critical introduction to the assignment and a debriefing period, students might, in the end, deem the gameplay experience as "filler" or even as an instructor's attempt to pander to their likes and desires."* In this study, instructor's support in digital games based learning environment has been tested as a moderating variable. Hence, it has been hypothesized that:

H 4(b): Perceived instructor support moderates the effect of use of digital games on learning satisfaction of the students.

H 4(b): Perceived instructor support moderates the effect of use of digital games on learning performance of the students.

The proposed research model is shown in Figure 1.

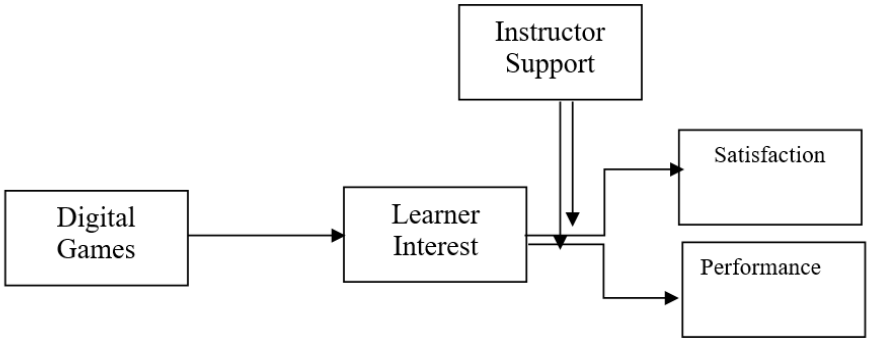

Figure 1. Proposed research model

Research design and methodology

To assess the value of the proposed method, an experimental designed study was conducted. This experimental study investigated the effectiveness of digital game based learning in business education. As this specific study is concerned with the evaluation of attitudes of students toward digital game, hence, it would not have been feasible to set up multiple control groups (Connolly, Stansfield & Hainey, 2011). Therefore, the experimental design used for the study was pre-test game post-test.

Research population and sample

The population participating in this study was students of BBA (Bachelor in Business Administration) Program. The sample of the experiment consisted of the students of the two classes who had joined fifth semester of their BBA Honours degree program and were undertaking Operations Management course. Hence, the study was set in the context of a core business education curriculum subject. To be included in the study, students should have successfully completed the introductory classes of Operations Management, especially the topic of project management and had to be proficient in computer usage. Prior to their enrolment, all students who participated in the study were informed of the purpose and procedures, after which all showed their willingness. In this experimental set up, students from the Operations Management course were randomly assigned to these groups. A total of 47 students for the experimental group were recruited from three classes of the same course, while 40 students were included in the control group. 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 gaming session. Subjects were allowed to share and discuss with each other their progress and scores. In short, game was played in a socially collaborative environment. One class was assigned to the experimental group (N = 47), while the other class was assigned to the control group. The two classes were taught by the same instructor, so that different teaching methodology does not affect the results. The students in experimental design learned the project management topic using the game, while the other group was taught in a conventional way.

Procedure

For this experimental design, there were two classes of students who were assigned to the pre-test Game post-test experimental design. Prior to their actual interaction with the game, the subjects were given brief oral instructions on its use by the researcher. Throughout the interventions, the researcher also observed students' interaction with the game and also provided procedural help to the students. The gaming session was conducted a classroom where each participant was seated in front of a laptop computer (Figure 2). The researcher arranged

for Wi-Fi Internet as the game was to be played online. Before staring the game session, a pre-test was taken from both groups. This test contained particular questions about the game topic. After the gaming session, a post test was taken from the experimental group. In a subsequent teaching hour, the subjects were administered a questionnaire. Subjects filled the questionnaires anonymously, in their classrooms, in the presence of the researcher. Some of the students who were absent in that class but attempted the gaming session returned the questionnaire via email. The time needed for completion of the questionnaire were approximately 20-30 minutes.

Instrument

Both, the subject test and questionnaire, were used to assess their performance and opinions. Since the validation of the instructional effect of using games was the main objective of the study, pilot test was managed. Subject experts were involved in carrying out pilot testing to ensure validity and reliability of criterion measurement of questionnaire. All variables were rated on 5 point Likert scale. This study adopted the measures used to operationalize the constructs from the previous literature, with minor rephrasing to tailor these measures to the game based context.

Material: My Sust House: The Game

The game selected for this study was My Sust House which is a collection of exciting interactive games related to environment, building and the town which can be used for different subject areas like project management and operations management. The game dealt with an eco-friendly house building project. In the words of Architecture and Design Scotland (2006) "The environment game explores ways to create a more sustainable environment. The building game challenges the children to build a sustainable house. Player receives a printable certificate with their score." This game helps to apply critical thinking by making informed decisions. These games are equally suitable for science, social studies and technological studies. These games can be accessed at http://www.mysusthouse.org/.

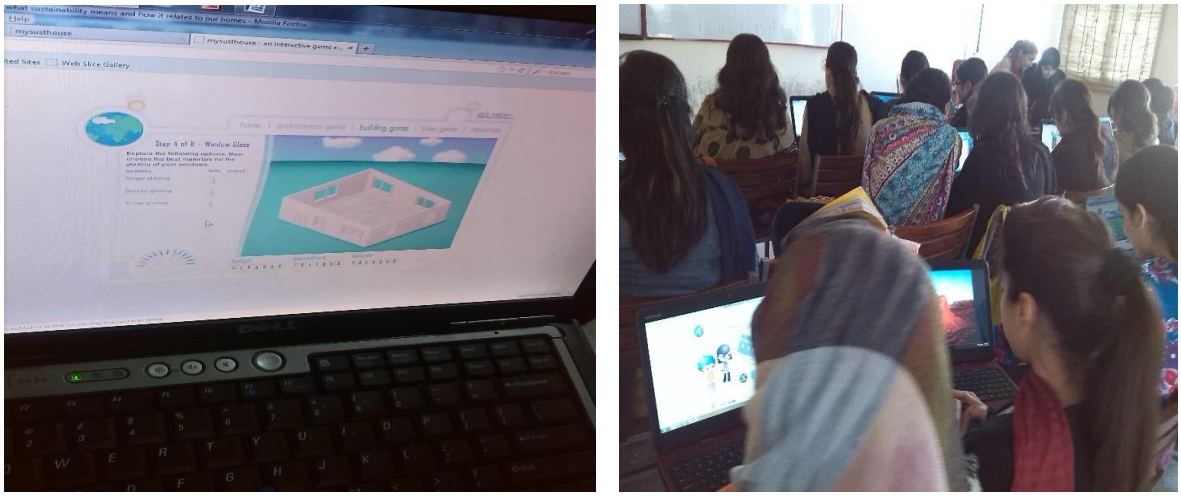

Figure 2. Students playing games in the classroom

Data analysis and results

In order to analyse the data of this experimental study, partial least square method was employed using SmartPLS software. The SPSS software was also used to analyse pre and post test scores of the assessment test. An independent sample t-test was run before starting the game session in the experimental group. The pre-test was taken as a knowledge test about the project management of a house building. The results did not show a significant difference (M = 4.6, SD = 2.59, $t(85)$ = 0.37, p = .71), between the control group and experimental group as shown in Table 1. The independent sample t-test was further run to find the difference between pre-test and post-test knowledge test between the two groups. The statistics show that subjects who played game for learning scored higher (M = 6.71, SD = 1.55, $t(85)$ = 8.29, p = .000, significant) than those who did not play game (M = 3.22, SD = 1.76, $t(85)$ = 8.29, p = .000, significant).

Table 1. Results of pre and post test score

		N	*M*	*SD*	*t*	*df*	*Sig*
Pre-test	Control group	40	4.65	2.60	.37	85	.710
	Experimental Group	47	4.45	2.48			
Post-test	Control Group	40	3.23	1.76	-8.29	85	.000
	Experimental Group	47	6.17	1.55			

PLS path model estimation and evaluation

To test hypothesized relationships among variables in game based learning context, path analysis was done by using Partial Least Square (PLS) analysis with the help of SmartPLS 3.0 trial version software. The conceptual model of the current study comprised 5 latent variables with 30 observed indicators. Due to the sample size of 47 in this experimental study, the covariance based modelling would have been unfeasible. The PLS model by using the SmartPLS 3.0, data was analysed in two stages: first, the measurement model was assessed for adequacy and secondly, the structural model was weighed.

Measurement model

The statistics for measurement model are shown in Table 2. The values consist of AVE, Composite Reliability (CR) and Cronbach Alpha values. Composite Reliability and Cronbach Alpha represent the same reliability values. CR has been considered as an alternative to Cronbach Alpha in PLS modelling. Garson (2016) described that Average Variance Extracted (AVE) may be used as a test of both convergent and divergent validity. AVE reflects the average communality for each latent factor in a reflective model. The values given in the Table 2 show that composite reliabilities CR of all five latent constructs were all above 0.80, meeting the minimum criteria. The values of AVE, as a measure of convergent and discriminant validity, are all meeting the requirements of minimum 0.5.

Table 2. Measurement model statistics

	Variables	R^2	Adjusted R^2	AVE	CR	α
1	Game play			0.495	0.906	0.885
2	Learner interest	0.390	0.377	0.562	0.834	0.730
3	Learning satisfaction	0.699	0.671	0.706	0.878	0.791
4	Learning performance	0.693	0.664	0.550	0.859	0.793
5	Instructor support			0.456	0.868	0.827

Structural path estimation

The structural model was tested by estimating and testing the significance of the structural path coefficients (direct effects) and then their indirect effects of the latent variables through mediating and interaction terms. The mediation test was conducted by observing the significance level of the indirect paths that emerged from the independent to the dependent variables, using the bootstrapping procedures incorporated in SmartPLS.

The results of mediation analysis for both learning performance and learning satisfaction as dependent variables are shown in Table 3. In this test, level of significance of the indirect paths both in the absence of the intervening variable (total effects, denoted C paths) and in its presence (direct effects, denoted C^0 paths) were examined. The values in Table 3 shows direct, indirect and total effects of independent, intervening and dependent variables.

The statistical values for mediation analysis in Table 3 show that the independent variable, game play has significant effect on both learning performance (β = 0.71, t = 7.69, p = .000) and satisfaction(β = 0.77, t = 9.38, p = .000). This independent variable also has a significant effect (β = 0.63, t = 8.59, p = .000) on the mediating variable which is Learner Interest. Hence, assumptions for path "c" and "a" had been met. However, when it came to path "b" that is the effect of mediating variable, Learner Interest on dependent variables, it did not come out significant i.e., for Learning Performance (β = 0.11, t = 1.34, p = .18) and for Learning Satisfaction (β = 0.16, t = 1.40, p = .16). In this way, the third assumption about the mediation effect turned out as insignificant. Hence, in this examination, the initial assumptions of a complete mediation analysis could not be met. The Learner Interest might be a good variable in the model still, but it is not mediating as theorized. Hence, the hypotheses *H1. Use of digital games for learning significantly affects perceived learning satisfaction of the students* and *H*

2: Use of digital games for learning significantly affects perceived learning performance of the students have been accepted.

Table 3. Hypotheses testing of learning satisfaction and perceived learning performance

		Direct effect			Indirect effect			Total effect		
		β	*t*	*p*	*β*	*t*	*p*	*β*	*t*	*p*
1	Game Play → Learning performance	.641	5.363	.000	.069	1.296	.196	.710	7.697	.000
2	Game Play → Learning satisfaction	.668	6.587	.000	.099	1.265	.207	.766	9.387	.000
3	Game Play → Learner Interest	.625	8.596	.000				.625	8.596	.000
4	Learner Interest → Learning performance	.110	1.344	.180				.110	1.344	.180
5	Learner Interest → Learning satisfaction	.158	1.404	.161				.158	1.404	.161
6	Instructor Support → Learning performance	.174	1.813	.070				.174	1.813	.070
7	Instructor Support → Learning satisfaction	.108	1.017	.310				.108	1.017	.310
8	IS*LP → Learning performance	-.073	0.991	.322				.073	0.991	.322
9	IS*LS → Learning satisfaction	.152	1.683	.093				.152	1.683	.093

Note. Game Play → Learning Satisfaction (R^2 = 0.69), Game Play → Learning Performance (R^2 = 0.693), Game Play → Interest (R^2 = 0.390).

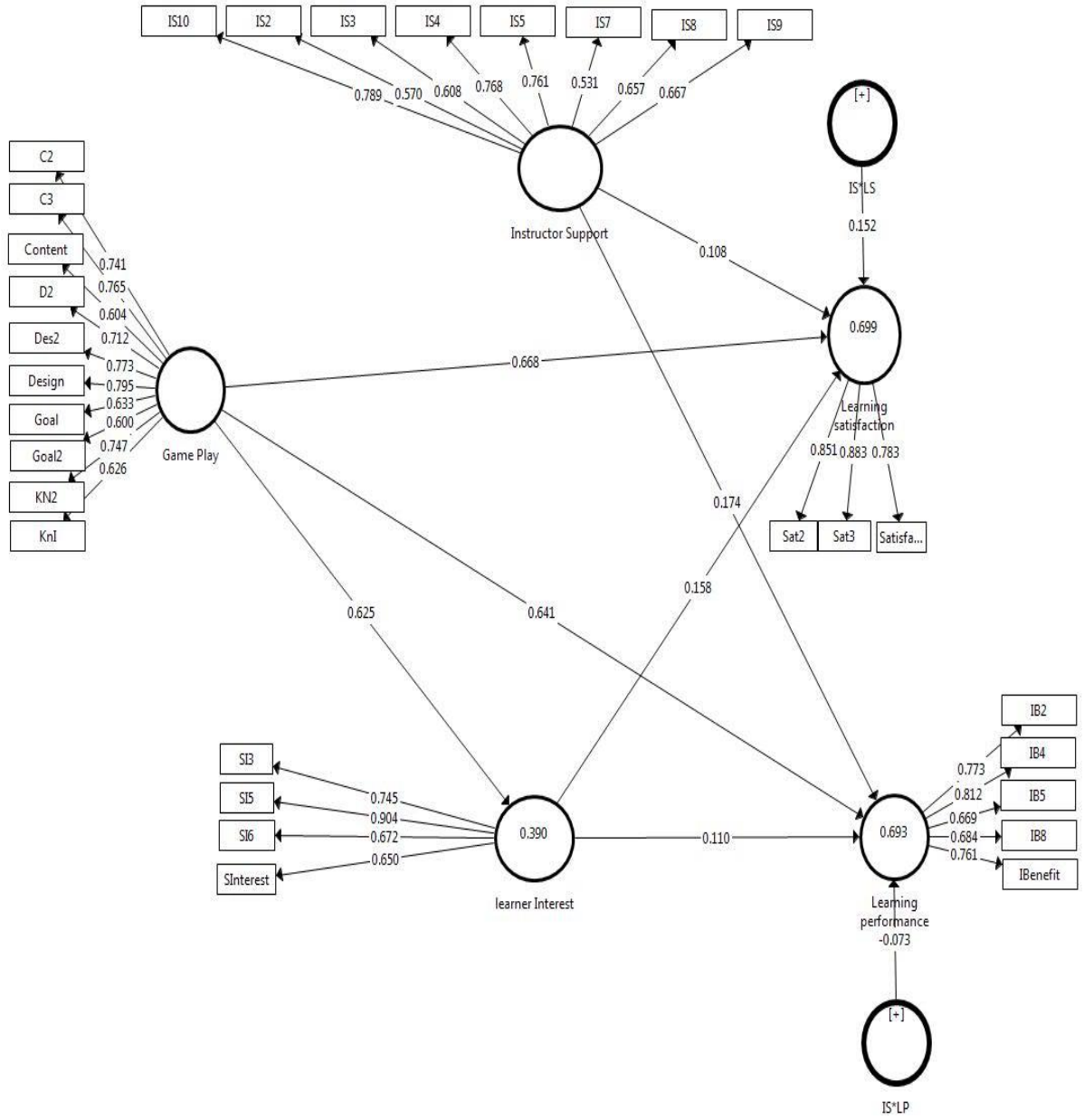

Figure 3. Path analysis of variables

The path analysis values are shown in the Figure 3 while Table 3 contains the values of beta, t value and significance level for the effects of variables on each other. In the first step, it was assumed that game play for learning has a positive effect on learning satisfaction of students. This hypothesis was supported by the values indicated in the Table 3. The beta values (β = 0.67, t = 6.59, p = .000) confirm that Game Play significantly affects the Learning Satisfaction of students. The second assumption was about the positive effect of Game Play on students' perceived Learning Performance. The resulting (β = 0.64, t = 5.36, p = .000) values again confirmed the positive and significant effect of Game Play on students' perceived Learning Performance. The effect of game play on creating learner's interest was also assumed positive. The values of (β = 0.63, t = 8.59, p = .000) again confirmed this assumption as well. The direct effect of Learner's Interest on Learning Satisfaction and Learning Performance did not come significant i.e., (β = 0.16, t = 1.40, p = .16) and (β = 0.11, t = 1.34, p = .18) respectively. Hence, assumption about mediation effect of Learner's Interest could not be scrutinized or confirmed. Hence, the hypotheses *H3(a): Learner's interest mediates the effect of use of digit games for learning on learning satisfaction* and *H3(b): Learner's interest mediates the effect of use of digital games for learning management system for learning on learning performance* have been rejected.

Moderation analysis

Moderation analysis was also done in this study, as this study used one moderator. The inclusion of moderator in a model, alters the strength of relation between two variables. The effect of Instructor Support was examined on both dependent variables that are Learning Satisfaction and Learning Performance. The statistics shown in Table 3 indicate that the direct effect of Instructor Support on Learning Performance was (β = 0.17, t = 1.81, p = .007) and on Learning Satisfaction was (β = 0.108, t = 1.017, p = .310) which were clearly not significant. As the main effect was not significant, hence, the interaction term did not turn out to be significant on both Learning Performance and Learning Satisfaction (i.e., for Learning Performance, (β = -0.073, t = 0.99, p = .32) and for Learning Satisfaction (β = -0.152, t = 1.68, p = .093). Hence, the moderation effect did not turn out to be significant in this analysis. Hence, hypotheses *H4(a): Perceived instructor support moderates the relationship between use of digital games for learning and learning satisfaction and H4(b): Perceived instructor support moderates the relationship between use of digital games for learning and perceived learning performance* have not been supported.

Discussion of findings

The study examined the effect of employing games in pedagogy on students' satisfaction and their perceived learning performance via a mediating role of learner's interest and a moderating role of instructor's support. In order to answer the research questions, a pre and post-test assessment was made from the students' control and experimental group. The score differences indicated that subjects who were introduced to games, had seen a significant change in their knowledge after playing the game and subjects in control group who did not play the game did not show much difference in pre- and post-test. After playing the game, students in the experimental group were asked to express their opinions on a Likert scale questionnaire, so that theoretical relationships could be examined. The statistical results show that use of digital games enhances students' Learning Satisfaction and Learning Performance. This indicates that students who play games to support their education, are more satisfied with their learning outcomes and with this instruction method. They believe that this tool and technology would bring significant change in their learning performance.

These findings suggest that blending an interactive game-based approach with traditional classroom delivery increases learning effectiveness of students in higher education. These findings are consistent with many previous studies for example a study by Kanthan and Senger (2011) confirmed that use of digital games for education improved academic performance of the students, increased their satisfaction and engagement and decreased their stress as well as "*foster an improved, facilitated, fun, nonthreatening, extended student learning environment*."

The current study also examined the mediating role of learner's interest in this game play environment. It was assumed that using game for learning actually creates interest among learners about the technology as well as learning and this interest creates satisfaction and their perceived learning performance. When this assumption was tested statistically, it was found that game play undoubtedly increases learner's interest like Ting (2010) confirmed in his study that using a game in teaching, increases student's interest in learning and Zafar, Mueen, Awedh and Balubaid (2014) in their study also concluded that students using games reported more enjoyment and better understanding of subject.

On contrary to expectation, the effect of this learner's interest on students' satisfaction and perceived learning performance could not bring significant results. Hence, Learner's Interest could not be proven as a mediator in this study. This result was consistent with one of the study of Seo and Baek (2010) who established an indirect effect of games fantasy on achievements in learning via interest, intrinsic motivation, and storytelling as mediator variable. He found that although interest is the "strongest factor of fantasy in educational games, but it did not show a significant effect on academic achievements."

Although the mediating effect did not bring significant results, however, Learner's Interest still appeared as a significant variable in the context of game base learning. These unexpected results may have been due to a low sample size, or distinctive features of the study and game. Irrespective of the theoretical role of this variable, the findings clearly suggest that variance in use of game can bring Learner's Interest. This, in turn, prove that interest is a valuable part of game based learning environment, although, it was not a mediator as theorized in this research. One finding can be drawn that game play has a strong direct relationship or effect on Learning Satisfaction and perceived performance, rather than having indirect effect. Hence, it was found that Learner's Interest should be taken as a separate outcome of game play along with satisfaction and performance rather than having a mediator, like Meesuk and Srisawasdi (2014) studied a direct effect of game play on increased students' flow, enjoyment, learning, satisfaction and motivation. Future researches could use this study's results to investigate the dependency of effect of game play on learning satisfaction and performance is on learner's interest or not.

This study also tested moderating effect of Instructor Support to strengthen the relationship of game play and learning outcomes among the students. In this research, it was assumed that when students receive instructor support in a game based learning project, it strengthens the effect of the game play on their learning outcomes, like satisfaction and performance. Contrary to the expectations and literature support, the instructor support in this game based environment could not turn out to be a significant variable or having a moderating effect. González-Cruz et al. (2003) examined the different levels of instruction support i.e., detailed, intermediate and minimal. They found that although instructional support is necessary in using computer simulations, however, the students must have some freedom while using this simulation, rather than having teacher's "*still reviews and comments on their work afterward*." Due to this, they suggested to use the *"intermediate level of instruction, where both freedom and structure are offered*." In the light of these previous findings, it can be inferred that instructor support could not be proven as a significant moderating variable does not indicate a zero effect or an exclusion of the variable. In fact, it shows that the level of instructor support needs to be carefully studied. It is not instructor support as a whole, in fact it is the level of instructor support that matters in bringing learning outcomes in game based sessions as Podleschny (2012) observed "*the teacher role in relation to the gameplay was indeed not fixed, but constantly re-configured by the actions and interactions of the network*"

By applying the activity theory, subjects found in this study were players of the game and the artefact used to mediate the activity was digital game. The prime motive to be engaged in this activity was better learning effectiveness and the outcomes of this activity fulfilled the objectives i.e., positive learning outcomes. Regarding the community, game was played in a physical environment, where traditional way of interaction took place among the members. The rules in this activity system were rules set by games programmers. The primary division of labour within this game based environment was students as "active learner" and teacher as "facilitator." The theoretical lens of activity theory provided a context to understand and relate the students to their objectives, outcomes, tools, community rules and roles. The findings from this study supported incorporating the activity based game culture and collaborative culture into the classroom.

The major finding of this study which could possibly contribute to theory is that instructor support could not bring statistically significant results on the effect of digital games on learning outcomes. Keeping aside the methodological limitations like small sample size, single context study, gender sensitivity, this insignificant instructor role posits some questions and challenged to the theory. In activity theory as the instructors role has been taken as a coach, facilitator or guide which is different from the traditional teaching role. The findings of this study posits a need for theory to actually define the role of instructor in technology mediated learning environment. It raises some questions for the theory which are:

- When technology is introduced in education, does it bring a shift in teaching role?
- Do students become more independent and teachers' role is minimized in technology mediated learning environment as pointed out by Smith (1997) that "the teacher is no longer the dominant source of information for the students?"
- Is there a difference between learning of digital immigrants and digital natives, as digital natives being more tech savvy need more autonomy for self and independent learning in technology mediated learning environment?

According to activity theory and many other previous researches, instructor support is an important factor during learning. As the game is supposed to be integrated in an instructor led classroom, hence, the level of instructor support in traditional classroom and in game session may be different. Therefore, the insignificant results in this study point out to define the difference of this role. It might be possible that the in significant result arise due to the continuous support of instructor during game play, however, in reality, game players would ask for some freedom. The findings from this study posits a need to exactly define the level and type of instructor role in technology infused learning.

Limitations and future research directions

Despite the significant contribution of this study, it is not an exception from limitations. First, the study used an experimental method that was conducted in a short period. The educational settings in a university don't allow such long and repeated measures. Hence, repeated measures and long-time investigation might provide more insights into this phenomena. Second, the study was conducted on specific subject of project management among University students. Keeping in mind that there is a severe shortage of such studies in Pakistan, this attempt is a novel approach in this country. Hence, these mentioned limitations may be acceptable. As this study focused on attitudes and opinions of students, future studies should also investigate teachers' point of view that how much digital games have facilitated their work. Future studies are also required to study larger samples across many universities in the country which may provide deep insights into phenomena. Future studies should also account individual differences of learners and their gender on the intention to play games for education. This study is just a beginning of further practical investigation of these and many other constructs of the game based learning model in the context of developing countries, where there is scarcity of such technologies for learning and teaching. This research also demonstrated the necessity of understanding those constructs that actually bring the effectiveness of game based learning. Such as, technical attributes of games like three dimensional modelling, aesthetic effects, curriculum design and its integration in the game etc. Future researches should also investigate factors that could affect the usefulness of game play on learning efficiency such as students' self-efficacy, population size and diversity, instructional time in class, curriculum, and teacher experience with games or technology. Hence, a longitudinal study can potentially provide profound insights into this learning process.

Conclusion

The experimental study conducted in context of business education demonstrated that digital game based learning approach was effective in both promoting business education students' satisfaction and their perceived Learning Performance. It can, thus, be concluded that digital games for education are powerful tools that can be used for enhancing learning outcomes generally in higher education and specifically in business education. The study also raises some questions about the well-defined role of teacher in this experimental study of game based learning. It posits a need to determine the exact level and definition of teacher's role in game based learning environment, as the findings of this experimental study have provided possibility of a shift in teachers' role.

This experimental study in business education provides a hint about social change in current pedagogy setting in Pakistan. The social change is possible because the awareness and understandings of new technologies by students might increase the demand for these technologies as supplementary tools of learning and teaching. This can bring opportunity for publishers who could think about games or simulations as demanded component of textbook and curriculum material. As, it was anticipated before "*…it is clear that virtual learning is an industry which is striding forward all around us…*" (Blunkett, 2000).

Although not explicitly dealt with, the sample selected for this experimental study was female students. The findings of this study can be used to relate the gender based issues in technology mediated environments. In conclusion, this experimental research contributes to business education by testing the effectiveness of games as valuable supplemental pedagogy for bringing out the important learning outcomes. Hence, it is suggested to continue using as well as further exploring such innovative pedagogies for greater learning improvement in business education. This innovative pedagogy is easy to implement having strong impact on learners' interest. To effectively educate the current business students and future managers, both research and academia settings need to do more work on pedagogical processes, inspiring students' interest and learning effectiveness.

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