Evaluating the Effect of Learning through Business Simulation Game on Secondary School Students

By

Syed Shoaib Raza Zaidi

2015-NUST-MS-ITE-11950

Supervisor

Maajid Maqbool

A thesis submitted in partial fulfilment of the requirements for the degree of Masters of Science in Innovative Technologies in Education (MS ITE)

In

School of Electrical Engineering and Computer Science

National University of Sciences and Technology (NUST)

Islamabad, Pakistan.

June-2019

Approval

It is certified that the contents and form of the thesis entitled **"Evaluating the effect of Learning through Business Simulation Game on Secondary School Students** "submitted by **Syed Shoaib Raza Zaidi** have been found satisfactory for the requirement of the degree.

Advisor: Maajid Maqbool

Signature: _____

Date: _____

Certificate

Certified that the contents of thesis document titled "**Evaluating the effect of Learning through Business Simulation Game on Secondary School Students**" submitted by **Syed Shoaib Raza Zaidi** have been found satisfactory for the requirement of the degree.

Advisor: _____

(Maajid Maqbool)

Committee Member1: _____

(Dr Sohail Iqbal)

Committee Member2: _____

(Dr Sharifullah Khan)

Committee Member3: _____

(Miss Erum Afzal)

Dedication

This thesis is dedicated to all my teachers, my supervisor, GEC members and friends who have supported me through this journey. It is only due to their prayers, cooperation and support that I have been able to complete this.

CERTIFICATE OF ORIGINALITY

I hereby declare that the research paper titled "***Evaluating the effect of learning through business simulation game on secondary school students***" my own work and to the best of my knowledge. It contains no materials previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any degree or diploma at NUST SEECS or any other education institute, except where due acknowledgment, is made in the thesis. Any contribution made to the research by others, with whom I have worked at NUST SEECS or elsewhere, is explicitly acknowledged in the thesis.

I also declare that the intellectual content of this thesis is the product of my own work, except to the extent that assistance from others in the project's design and conception or in style, presentation and linguistic is acknowledged. I also verified the originality of contents through plagiarism software.

Author Name: Syed Shoaib Raza Zaidi

Signature: _____

Acknowledgment

I am grateful to my supervisor, Sir Maajid Maqbool who has been an excellent mentor and has not only guided me through the process but has also kept me motivated in difficult times and problems during the thesis.

I am also thankful of Miss Erum Afzal for guiding me and supporting me throughout the program and has shared a lot of guiding material at crucial times other than arranging special workshops and proof-reading my document.

I also want to thank my committee members Dr. Sharifullah Khan and Dr. Sohail Iqbal for their support, encouragement and cooperation.

Last but not the least I would like to thank my Head of Department Dr. Sohail Iqbal for providing guidance and a chance to improve the document.

Table of Contents

List of Abbreviations

SW: ShapiroWilk

App: Application

BSG: Business Simulation Game

GBDL: Game Based Digital Learning

MCQ's: Multiple choice questions

UI: User Interface

SPSS: Statistical Package for the Social Sciences

SG: Serious Games

List of Tables

List of Figures

Evaluating the effect of learning through business simulation game on secondary school students

Abstract

Teaching and learning through games is an interesting and innovative method in education. The young age groups of population spend thousands of hours in playing games and it has been proved that this activity improves their cognitive skills. The rising interest in games as a tool of teaching & learning has led to the development of many serious games. Simulation games not only provide the player with the real scenarios at a low cost but also provide an opportunity to experiment which is an integral part of learning for students. Traditionally business has been taught through books and examples but has never been taught through simulation games wherein students would be able to make real life decisions and check the impact of their choices. The purpose of our study is to understand the impact of business simulation game as a tool of learning. Business is a complex subject and requires knowledge on a range of concepts such as managing finance, knowledge of market, marketing tools etc. To teach all of these concepts in an integrated environment is a challenging task. The best way to teach this subject is by taking help from the technological advances and creating an environment where all of these concepts can be taught and tested at the same time. Adopting the path of simulation games is not only inexpensive but also beneficial for a larger audience in the longer run. Our goal is to investigate the student's level of understanding of business that this simulation helps in providing to secondary school students.

1. Introduction

This chapter includes the background to the topic and the importance of games as a tool in education. It also includes motivation to work on this topic and a brief study overview.

1.1 Background

Revolution in development of technological equipment has changed the way people work and perform various activities such as play games, learn or spend free time. Digital games have a massive impact with immersive experience and engaging features such as high quality graphics and more control in game play etc.(Connolly, 2012). Fun and learning happens simultaneously in games (Marc Prensky, 2001).

Game is a competition played with fixed rules and rewards to entertain and engage the players (Michael Zyda, 2005). Games developed with specific requirements to meet learning goals are called instructional games (Sara de Freitas, 2006). Game based learning is being used at different levels in various fields ranging from marketing, finance and education. (Mazeyanti Mohd Ariffin, 2014).

The young generation spends a lot of time playing games which demands from the teachers to practice a new and better method to teach these game players (Prenskey, 2001). It is hard for the digital game players to learn the content in the old archaic ways and the teachers have to equip themselves with new methods to provide knowledge in engaging manner to these learners. There have been a lot of studies on leisure based games whose purpose is solely fun but research on serious game needs intense effort to prove these games as an effective tool of learning.

The development in games has seen a spike in recent years due to technological advances and availability of inexpensive phones and laptops which are used to play these games. Traditionally the purpose of games was fun and learning. Now game developers have started developing games which have an element of learning and stimulation for the players.

Educators have ignored the benefits of computer games. (Squire, 2003) Despite slow movement in adoption of games the research shows that numerous games are developed for the purpose of meeting educational goals (Aldrich, 2005).

It has been found that games have cognitive, behavioural and motivational impact onlearners regardless of their age, subject interest and socio economic environment. Games have a role in self-motivating the learners and improving their knowledge acquisition as well (Kirk, 2004). Digital games are far more effective as a learning tool because they provide scaffolding and support to the learners at appropriate time and stage (Juo-Lan Li, 2010). The students get a concrete experience and they can reflect on it to improve their conceptual understanding about the topic with more engaging and fun way than that of tradition methods being practiced in a traditional classroom setup.

Digital game based learning is a competitive exercise done by students in order to achieve certain goals and maximise knowledge gain. The purpose of these games is to increase motivation or improve cognitive skills (S. Erhel, 2013). These games are developed with a goal to be achieved and gradually increase game difficulty as the player progresses towards the goal.

Students now have access to technology enabled tools through which they can teach themselves and game is a practical example of this technological development (Prensky, 2008). Technological revolution has made the development of games cheaper and research needs to be conducted on games at different educational levels and for various subjects to truly ascertain their benefits for the learners.

1.2 Motivation

Intense games with negative consequences such as violence and aggression have been the focus of early research (Connolly, 2012). There has been development of persuasive and serious games which have been used to change behaviours but the effect was hardly measured (Thomas Connolly, 2008). For learning to yield positive results it should not only be contextualised and active but also provide a good experience along with the feedback (T. Hainey, 2011).

Directed instruction is an essential element for students in a classroom. Lectures are designed to explain concepts combined with practical examples and students are evaluated by assignment, oral presentations and written exams. These teaching and learning methods can be made more interesting if these are taught in a gaming environment (Marc Prensky, 2001) This new environment can change their mind set from rigid concept to fun filled experience.

There are many evidences that learning motivation increases with the use of business simulation games being an effective teaching tool (Yi-Wen Liao, 2011). Linking the key factors self-motivation and engagement in the games creates a powerful learning experience for the students. (Kirk, 2004)

Pakistan has lagged behind in adopting the game based teaching/learning approach (Abida Ellahi, 2017). This approach to learning can help a country like Pakistan where the teaching environment (buildings, furniture, stationary) and human resources are inadequate. Integrating technology in classrooms can increase engagement and reduce dropout rate which is at an alarming stage in Pakistan. Currently 24 million children are out of school in Pakistan for reasons such as a) school being at large distance from home, b) poverty, c) lack of focus on girls education and teacher absenteeism (Alif Ailan-2016).

Difficulty in understanding the course increases disengagement and lack of interest in the students. This also increases an unwanted attitude towards going to schools and learning. It is important to pay attention to solve aforementioned issues which requires analysis by providing them with appropriate scaffolding otherwise this may result in lack of motivation and discomfort for the learner. (Thomas M Connolly, 2006) .

Games are not adopted for teaching at secondary stage even though there is consistent evidence that games can improve learning abilities of students such as motivation, engagement and knowledge acquisition. Digital games help students in removing any misconceptions by leaving a positive influence on their learning. Students also feel empowered being independent in learning and understanding difficult concepts through interactive gamification. (Martin Ebner, 2007).

Collaboration and critical thinking are two of the essential skills of 21st century education. Companies now require skilled workers who can make independent decisions and work efficiently with machines. Games don't just enhance the aforementioned skills but also the interaction among students (Hwang, 2012). If the students are not involved in their learning journey; their task becomes dull and boring for them thus resulting in lack of interest and poor knowledge gain. Knowledge acquisition through games is more interactive than traditional means.

The business simulation game used in this project teaches concepts such as marketing, sales product distribution etc which are demanding 21st century skills. The young population of the country needs to understand business concepts in order to fulfil the market demand of

the future. With the above observations in mind, this study aims to teach business concepts through a business simulation game and test the effects on the understanding of secondary school students in Pakistan.

1.3 Study Overview:

The purpose of this study was to test if business simulation games play a positive role in enhancing student performance and increase their understanding of the concepts being taught to them in the domain of business. Recent research shows notable outcomes on the use of games as a teaching medium. The reason of adoption is its practical benefits and low cost of technology.

The research problem is to understand the effects of the business simulation game on the students and how much of a difference is there when teaching is done with the game. A quasi-experimental study was conducted on a sample of 60 students in total, representing 30 members in each group i.e. control and experimental. The results were promising. Therefore, it is concluded that business simulation games play a positive impact in learning business concepts aligned with the requirement of business companies.

The study had certain limitations. Firstly,it dealt with a smaller number of topics as confined within the game. More over due to school schedule, the game couldn't be played for longer time duration. A study with longer time duration for further strengthening of the results should be conducted to see impact on large sample size, gender based and variant age groups.

1.4 Research question:

Games are a growing medium among young generation and they spend more of their time in using latest technological gadgets and applications. It is pertinent to find out if teaching through games can result in effective outcomes. To address the above mentioned concerns and questions about the games as an effective medium of learning and teaching; the following research question was drafted.

Does learning through business simulation game help in understanding concepts of business effectively for secondary school students?

The outcomes of this study will be useful in the following ways:

1. Recommendations for the policy makers for considering teaching through games as an effective means.
2. Inspire teachers to use games as teaching pedagogy
3. Propose schools to adopt this methodology in other subjects
4. Suggest industry to make games in Pakistani cultural context which can be used in classrooms

2. Literature review

This chapter consists of details about games: serious games and game based learning. It also includes in depth analysis of effects of games and the areas where games are used as an effective method of learning. The chapter also takes a view of teachers and other stakeholders about serious games.

2.1 Games and Education

With technological changes emerging every year, educational sector has tried to adopt them for improvement. Whether it is games, animated books or other technological mediums only few have survived over time. High pace of technological advancements in 21st century has produced games as a very effective medium for engaging people. Engagement has been defined as focus towards a particular task in order to master it or get command over that task. Games are not only engaging people in play for an extended time period but also help in improving the cognitive abilities such as critical thinking or work in teams.(Lorenza S. Colzato, 2012).

Games have been determined to produce a positive result in learning environment. Application of games in learning settings have proved to be effective as it increases student motivation and collaboration with each other (Hwang, 2012).Many different materials such as books, helping resources, maps, pictures, videos and games have been developed to engage the learners in various fields such as medicine, military, management etc. Numerous institutes have welcomed the use of digital games because it promotes practical learning and improve learning environment (Tarja Susi, 2007). Classrooms where the teacher is supported by technological equipment such as multimedia, smart boards, computers, tablets, or laptops improves the overall learning environment for students of that class. Teachers can use this equipment to improve their teaching practices and impart the knowledge in different ways such as by taking pop quiz or teaching children with a game. These blended learning environments have positive outcomes on learning effectiveness in traditional classrooms (Abida Ellahi, 2017) .

Games aim to make complex knowledge simpler and repetitive play helps in creating in-depth understanding (Martin Ebner, 2007). Knowledge gain is further strengthened with repeated practice and awareness of past mistakes. Overcoming these mistakes or error helps in producing better results and boost confidence of the learner. Breaking down the game into

simpler steps/stages also provides better understanding of the game play and helps in building knowledge connections.

Time, cost, safety, risk etc. are some of the other factors that hinder the chance of true learning (Yien, 2011). Digital games can also be used to test different hypothesis which would have been difficult to test due to threat of loss it may cause in these unknown situations.These factors can now be mitigated by use of games in learning and teaching. Factors such as trying different models for prices and predicting demand can be done with serious games.

2.2 Serious Games

Use of serious games is increasing in education and business environments due to its benefits in real life situations (Tarja Susi, 2007). Games which are used for training, simulation or education are known as serious games. These games serve an educational purpose and are an important tool in e-learning. Serious games have been developed to focus on learning and understanding instead of entertainment or joy as the basic purpose (R. Michael, 2006). They are created with a specific goal and serve to improve the performance of their players. Serious games allow learners to practise actual circumstances of real world in different subjects such as accounting, evacuative training, drilling, management and other areas that are hard to replicate otherwise because of reasons like cost and risk (VanEck, 2006).

Serious games have also been used to help students understand difficult concepts they have to learn in various subjects (Connolly, 2012). A concept defined in a book or in a task is often difficult to understand and implement. The real purpose of game based learning is to capture and engage user for a longer duration to achieve certain goals such as to understand difficult concepts by using these games (Kevin Corti, 2006) . A difficult task disengages the person; making it even harder to complete it and move towards the next target. In a gaming environment those tasks are broken down into multiple steps to create an engaging environment for the learner.

The addition of pedagogy (method and practice of teaching) makes a serious game beneficial to use in a learning environment besides its story and software (Michael Zyda, 2005). The element of entertainment must be present at all time so that it has the full attention of the player. Games may require extra help resulting in formation of social groups or teams to finish the task within the given time frame. The games also have to be played with

established rules and may have to follow certain steps to proceed further in the game. Learning and teaching goals can be achieved in an efficient manner by using serious games (Nergiz Ercil Cagiltay, 2015).

The purpose of serious games is that the players learning process is paralleled with enjoyment so that he/she is constantly engaged with the game (R. Michael, 2006). The elements providing entertainment like mentors or characters, sound effects, high quality graphics and control over crucial decisions should not be overlooked in a serious game as they enhance learning and engagement otherwise there is a concern that anticipated learning goals will not be accomplished. Bad user-experience boosts negative feedback with regards to the game play and disenfranchises the players towards the game.

Fun is not the only element contributing to the player's engagement; factors such as main goal, milestones, rules and story of the game are equally important in the success of a serious game (Marc Prensky, 2001) (Savill-Smith). Serious games have problem solving in focus rather than providing rich experience like entertainment games. This major difference makes their development challenging because a balance has to be maintained between entertainment and the real goal of the game. Ignoring the aforementioned factor of entertainment decreases the desire to play the game.

2.3 Educational Games

Game-based Learning (GBL) points to an educational setting where games are used to teach and learn essential concepts (Yien, 2011). These games are also used to increase skills or change behaviour. There has been evidence that GBL can increase motivation for learning (Papastergiou, 2009). Motivation is necessary for any learning to happen because if the learner does not feel the need to learn he will not make the effort required to gain that knowledge. GBL provides incentive to learn by engaging students in a different way. There are many different types of games used in GBL such as role play, strategy, simulation etc.

Digital games are equipped with various play elements like sound effects, graphics, Character association etc. The games progress in stages and thus making it feasible for the learners to play who learn at a different pace. Games can also be paused and the speed of play can be manipulated making it feasible to play for all type of learners. It has been identified by research that games also support differentiated learner (Sara de Freitas, 2006).

Games provide players with an active experience and they learn by doing instead of just listening or reading (Jan K. Argasiński, 2018). Learning only happens when it is active and a student's active attention time span decreases if he is not actively engaged or is participating in the conversation. Unlike traditional mode of lecture where a teacher is actively providing information and the student receives it in a passive way; games requires attention from the player/learner in order to effectively pass the game stage. By continuously demanding attention game keeps the player active and interested in the play.

Advocates of games in education have reasoned that these games provide increased concentrated engagement, promote active learning and breaks down complex tasks (ke, 2008). These games also help in developing the transferable skills like critical thinking, problem solving, digital literacy etc.

Focus in serious games remains on learning objectives compared to entertainment games where focus remains on fun (R. Michael, 2006). Gaming activities keep the player engaged and also provide immediate feedback. This feedback helps in improving the overall performance of the player as he/she is able to identify and improve on mistakes. This also promotes active learning as the player is fully engaged in the game and feels empowered. A number of companies also use games to teach employees and call it a fun exercise. (Soman, 2013).

Students when taught with games lesson enjoyed the task more than compared to the students who were taught without games. They practiced the game and thus results were better compared to other children (Nienke Vos, 2010). There is a clear indication that when students learn with game they have a better flow experience and are more involved in the task.

2.4 Elements of a good educational game:

In general learning is a difficult task innately and motivation to learn decreases if interactive elements are absent (Martin Ebner, 2007) . Research shows that a well-designed game provides a better experience to the players. User-interface is pivotal in developing the relation between player and the game. Players can experience anxiety if the games interface is not easy to use or other features such as colours are not used properly.

It is imperative that elements such as engagement, fun, learning and collaboration are part of any game so that all the participants are actively involved in the game. The game should be technologically optimal, have good user-interface, enjoyable and provides a

rewarding experience to the learner even though in a serious game, the primary goal remains to highlight and solve the problem rather than provide a rich experience like other games. (Tarja Susi, 2007)

Games use entertaining power to provide a learning experience. Education and entertainment is balanced in a serious game. Game-makers should provide a complete experience in a game instead of focusing on a single aspect of the area in the game (Yien, 2011). By doing this the game-makers can provide better satisfaction to the players and can play as a factor in the continuous usage of the game. Studies have also shown that people do not learn on their own and need support and scaffolding throughout the process. A game in a learning environment should provide enough hints and scaffolds to keep the learner engaged with the game otherwise the intended goals of the game would not be achieved. Students should be helped with problems which require analytical skills by providing them with appropriate scaffolding otherwise this may result in lack of motivation and discomfort for the learner (Thomas M Connolly, 2006).

To produce a good game, creators and designers should sit with teachers and understand their concerns so they can accommodate various roles i.e. (game explainer, administrator) that teachers take on in such an environment (Björn Berg Marklund, 2015). The game should provide a manual within the game which explains the steps to successfully complete the game. The game should also contain appropriate guidelines regarding each stage and what to expect in that stage. A clear guideline helps a student to fully understand the requirements and increases overall performance in the game.

Game design patterns are essential in solving the problems related to the good development of games. The players can also act as stakeholders in designing the game (Ke, 2016). Affective serious games are a combination of gaming and computing. A game can influence a number of emotions such as excitement, boredom, interest, motivation or confusion depending upon how it is designed. It is a good step if the learners are involved in the design of the game and can provide valuable feedback while it is being developed.

Developing and designing a business simulation game (BSG) is a hard and expensive task. (Amory, 2007) has proposed the Goal Object Model for game development providing guidelines on visualisation of elements, problems and comprehensive perspective of game. A BSG must contain interactions for students and should be cost effective so that they are affordable by a larger audience. The games should be of commercial grade quality because

otherwise the students may lose their patience and engagement with the game. (Thomas M Connolly, 2006)

Games imitate the real world environment and should be complex enough to have certain expectation by the learner (Jan K. Argasiński, 2018). If the game play in serious games is easy and does not build knowledge connections the player would lose attention quickly and if it is too hard to solve the player would be intimidated by the serious game therefore, the complexity of game should be balanced so that all type of learners can be involved in it and they are self-motivated to play the game.

Games should also provide direct and immediate feedback to the learner in order to improve the performance of the player (S. Erhel, 2013). Without feedback there is no learning and the chances of improvement for the player diminish. Feedback loop is also important as it provides essential information regarding the mistakes which the player has committed between the play. Business simulation game should provide pointed feedback and elements such as score or a message like 'try again' should also be provided to encourage repetitive play by the learner.

Games should also demand planning and thoughtful decisions by the player in order to improve the performance (Burguillo, 2010). Based on the feedback provided in the game the learner needs to focus and improve their decision making in order to improve the score or achieve the goal demanded by the game during the play session. Such features enhance learner's interest and increases motivation to successfully achieve the goals of the game. Making thoughtful decisions also provides him a chance to earn different rewards provided in the game.

Games in other areas

Studies have shown that games used in teaching programming concepts have also been appreciated by the students where in students were able to solve difficult programming task thorough game (Papastergiou, 2009). Animated scenarios had shown a high level of student engagement. Serious games have been used in various areas and STEM subjects such as math, biology, science, technology etc. (Omair Ameerbaksh, 2019). This increased application of games in many areas suggests the growing interest of instructors across the board and is strengthening the belief in using serious games as a useful method of teaching and learning.

2.5 Factors effecting Game based learning

There are different factors which play their part in the effectiveness of game based learning such as motivation, game play, story, graphics, sound effects, competitiveness etc. Motivation and scores increased considerably by bringing competitiveness in serious games (Nergiz Ercil Cagiltay, 2015). Students spend more time in answering the questions and provided more accurate answers when they play in a competitive mode. Competition has been shown as a deciding factor effecting learning & performance goals in game based learning as demonstrated by (Chen, 2018) in his study.

Learning efficacy in games learning is also effected by students learning ability and playing skills (Fu-Hsing Tsai, 2012). Although student's background like gender, age, doesn't make a big difference with regards to playing and learning with the game but playing skills and attention towards understanding the game are important. A learner needs to focus attention on improving his game skills to gain maximum benefit from the game.

A key goal of game is not to discourage failure but also provide badges and awards for the purpose of motivation (Patrick Buckley, 2017). This also brings a sense of achievement and success to the player and increases interest in the activity thus promoting active learning. Students play repetitively and spend more time in playing the game if positive reinforcements like badges are present in games.

Educational background does not affect the performance of students learning through game based learning (R Davies, 2010). Students can equally benefit and learn from gameplay since they are not bounded by factors such as teacher's pedagogy, language, and environment and learning materials. The game is played with the same rules by everyone and similar results are expected of the players. If the students have understood the rules of game they can improve their score by repetitive game play and by improving their mistakes.

It might be difficult for the first time players of the game to fully understand its features and be successful in the game play thus resulting in fear of the game and incomplete learning goal. Learning through simulation game had a better effect when it was accompanied with a demonstration from an expert (Omair Ameerbaksh, 2019). Students had a better understanding of how the game was to be played and what rules are to be followed to be successful in achieving the goals of game.

Designers should focus on multiple aspects of game while designing a game in order to fulfill all the requirements of a successful game. Although it could be a challenging task but only a well-designed game would bring the desired experience to the learner.

Teaching with simulation would increase the speed of student's progress in the course (Hwrang, 2001). Business simulation games usually cover different aspects of the knowledge areas and provide information by connecting concepts. When students learn by playing, their understanding of the course increases manifolds. Their questions, which arise due to game play are answered by the teacher/facilitator and they show a better performance in the course.

2.6 Techniques facilitating game based learning

Teachers should teach students in their natural environment rather than creating special environments because learners may face issues like anxiety or take longer to adjust to the new settings. Lab studies measuring effectiveness of digital game based learning should be avoided as enjoyment can be effected in that environment. (Anissa All, 2015).

Games must be supported with appropriate scaffolds in order to extract maximum benefits from this pedagogical technique (Juo-Lan Li, 2010). Without appropriate help or hints at difficult stages in the game learner can face issues such as lack of understanding in solving the game or moving on without proper understanding thus leaving a gap in proper knowledge acquisition.

It is important that students are not distracted with solving technological issues but rather can focus on their game along the team to generate flow experience (Wilfried Admiraal, 2011). Technical issues such as dealing with memory leakages, setting up a computer, installing the game successfully etc. should be dealt by the teacher or the technical administrator. Students should solely be focused on playing the game in order to attain the maximum benefits from it.

Self-debriefing can be a powerful technique in enhancing the effect of game based learning (Juo-Lan Li, 2010). Self-debriefing is a process in which learners are asked to reflect on their experience with questions. Studies have indicated that students who practice self-debriefing had a stronger knowledge gain compared to the students who do not practice this. The games help the students with new experiences and consolidate their conclusions.

Learning advice and support should be provided in a subtle way to the learners while they are playing the game (Leemkuill, 2012). It is vital that students are provided with hints in the game in a way that it is not obvious because it can decrease student interest if the hints are obvious and point towards steps which make the problem-solving in game extremely easy. If the game becomes extremely easy for the students they can lose interest in it and stop further repetitive play resulting in incomplete knowledge or remaining unsatisfied even after the game play.

2.7 Simulation games in business courses

Motivation is the key element for any player to be involved in the game and this turns educators towards the game-based approach (Kevin Corti, 2006). In recent years business games are becoming popular due to their support for learning motivation. The purpose of these simulations is to achieve a specific goal and outcomes while keeping the player motivated to learn and a well-designed simulation game effectively serves this purpose for the learners. It provides a chance for the learners to plan and mitigate risks according to their skill level thus keeping learners with different skill level interested in the game play.

Simulations provide a risk-free platform to attain expertise and master a skill to teams and individuals. This hands-on approach and experiential learning along with fast and pointed feedback improves learners approach towards the problem (Barišić). In life there is a real danger that a single move in the wrong direction can cause heavy losses to the enterprise, therefore it is necessary that we take extreme caution while making decision or predicting any future circumstances. Simulation games provide a platform where learners can practise all kinds of circumstances such as ordering extra stock, lowering the cost of good to see competitors and market reactions. They can also take steps such as changing the quality of goods and branding or apply different distribution strategies. All of such steps introduce learners to the real life practices and improve their decision making skills.

Business simulation games is a requirement to enhance decision making skill in complex environments and to improve the cognitive abilities (Hwrang, 2001). These skills can be polished in an effective and inexpensive way by practising game repetitively. Learners can create all kinds of scenarios using their own creativity and their command increases over the game as they play different scenarios. A game presents different scenarios and strategies and the learners have to use different knowledge areas to improve performance in the game.

These decision making skills improve as the connection between different knowledge areas also become stronger with every playing session. Business simulation game play boosts learner's confidence as he builds new connections and covers different knowledge areas.

Students who have used games during study have reported more enjoyment and better understanding of the concepts (Abida Ellahi, 2017). Students feel empowered and joy when they are free to make decisions and are not afraid of consequences. Games also provide them to take a fresh start even if they have not performed well in their game play session. Such opportunities are extremely rare in real life and discourage them from taking risks. The factor of enjoyment also encourages repetitive play and on successful results they are happy to share their results with their peers.

To conclude, games should have a clear goal which is meaningful for students. The game should show clear sign of progress for the students and vice versa. Some random elements linked with game increase student interest.

2.8 Teacher's view and role in Game based learning:

Empirical evidence has shown teachers reluctance towards adopting games as a means of study in higher education (Tao, 2012). Even though there is plenty of evidence that game play increases students motivation, covers knowledge gaps and its use is appreciated by the students; a study in Taiwan found teachers challenging the use simulation games in their lessons. The lack of support in the form of training, facilities and encouragement was the reason behind many teachers not adopting the game as a teaching and learning tool. To increase the use of business simulation game the departments should facilitate teachers by providing them with training and promoting eLearning environment and culture in their institutes.

Teachers are the main factor behind introducing the games in the class room and ironically they are also an obstacle in adopting the use of games. Even though the benefits of use of games have been accepted by the teachers the motivation to use these games as a new tool has remained low among teachers (Sol Calabor, 2019). Despite availability of resources the use of games has remained low because of unavailability of appropriate games for the students. Lack of knowledge about existing games to the teachers is also a big factor behind not using the games in their everyday use. Teachers also fear that the students will end up just playing the game instead of learning the real knowledge thus wasting important time of the learning year. Lack of technical support and changes in course material is also a major reason for teachers disinterest in the adoption of games.

Teacher's interest towards technology must be taken in to consideration before assigning him any game related subjects. Support by teachers is vital to improve learning environment. It is essential to train teachers around the games as well because games alone are insufficient to provide the required motivation to play. Teachers have to take on multiple roles and provide scaffolds to improve the performance of the learners (Björn Berg Marklund, 2015). Teachers have an important role to play and provide scaffolds during the game play, they have to act as support out of game, be a subject matter expert and keep learners motivated.

There is a need to address the teachers concerns regarding the games as a tool in class rooms (Prensky, 2008). To introduce games on a larger scale in classrooms, teachers need to be taken on-board and should be helped by policy makers, game developer and designers. Without addressing their concerns it would be a futile effort to introduce games in class rooms. The teachers should be provided with adequate training. Games should be easier to install, play and understand. Class time or special sessions should be arranged to play the game during the study timetable of schools.

The games should be flexible and able to help practitioners in teaching the particular subject (Sara de Freitas, 2006). Lastly the games should be designed in a way that teachers can use them at different times like for exam revision or just to introduce the course. Games which can be used for multiple purposes will be popular among the teachers.

3. Methodology

This section has details of project settings, materials, sample size and the design method of research study. It also provides details on the time period and other important research aspects such as business game images and intervention images.

3.1 Research design and approach

3. 1.1 Overview

The basic idea of this study was to use business simulation game to teach the basic concepts of business to the students and understand if it is a better approach to teach students through it. The focus of the study was on the students of secondary classes. A quasi-experimental control and experimental group study was conducted with pre-test and post-test design. The statistical analysis tool SPPS was used to determine the status of the alternate and null hypothesis. The following chapter explains the approach taken towards the experiment.

3.1.2 Quasi Experimental design:

Quasi-experimental design takes on a similar route to an actual field study. The research takes place in a natural environment instead of a lab setting. The researcher doesn't have full control over the natural settings of the research place. There are several types of quasi-experimental designs as shown in the figure below:

- Pre-experimental design:
  - One group pre-test-post-test design;
  - One group post-tests only design
  - Post-tests only non-equivalent design.
- Pretest posttest non-equivalent group design
- One group time series

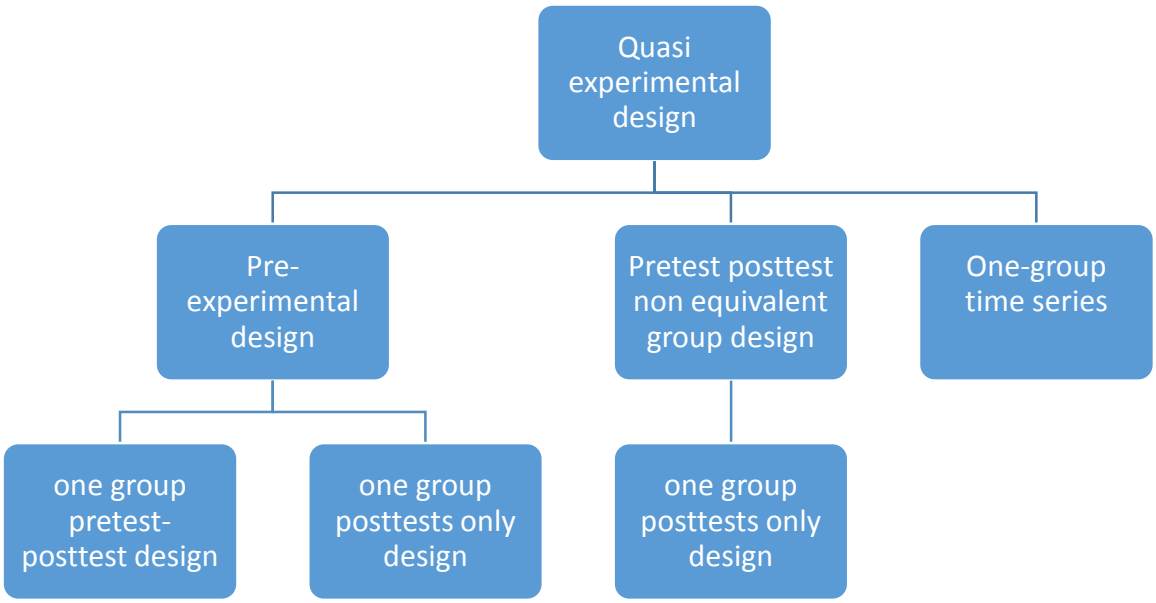


Figure 1quasi-experimental type design

In Pretest posttest non-equivalent group design both control and experimental group perform pre-test and post-test whereas only the experimental group receives the treatment and the results are measured later on.

For this study quasi-experimental non-equivalent control-group design was used. It was not possible to randomly assign the students to control and experiment group as the students were already allotted in their classes and sections at the local school.

This method of study was chosen because quasi-experimental is easier to set up and requires fewer resources. Secondly there are no ethical concerns with regards to health of groups in a quasi-experimental study. Lastly in a quasi-experimental study the threats to external validity are not important as this study is conducted in a natural setting and is not affected by factors of lab settings. The results of such a study can be generalised.

3.2 Group Allocation:

The goal of this research was to analyse if the use of business game had a significantly positive effect in the understanding of business concepts for students who had undergone an intervention. The quasi-experiment was conducted on students who were above the age of 16 and above. Students of secondary classes were chosen. The total population of

the students were n=60. There were more males compared to the females. Mixed gender groups were considered for the participation in the game.

3.3 Setting and sample

The business simulation game was played by age group 16 and above of students from a local school who were divided into control and experimental groups according to the design of the quasi-experimental study.

In order to set up an environment for a fair comparison two groups were divided randomly and were assigned to controlled and experimental group. To ensure uniformity, same instructor taught both groups in different settings. The researcher acted as evaluation assistant to gather the data from the group. The school had co-classes so both male and female participants were part of sample although females were fewer than males.

3.4 Group Size:

The Control and Experimental groups were of size 30 each. Table summarizes the demographics of the participants.

	Control Group	**Experiment Group**
Student of class	9^{th}	9^{th}
Total Participants	30	30
Gender Distribution	More males	More males

Table 3.1 Demographics of participants

3.5 Identifying and defining research problem

Morrison has identified a research path in his book which can be followed as guidelines while conducting the research in education. The first step is to identify the problem and create your hypothesis. Later on define your study and conduct its relevant steps as shown in the following figure:

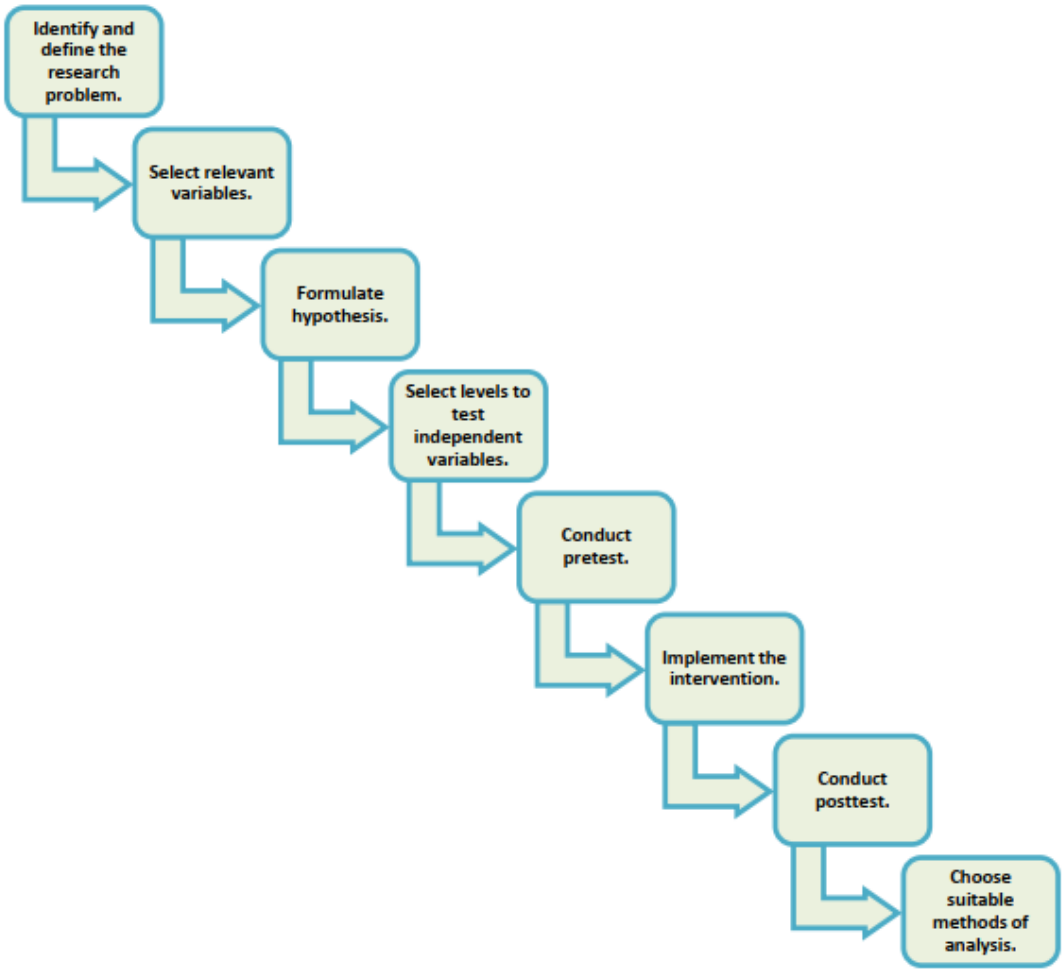


Figure 2 quasi-experimental research process

This study was an attempt to distinguish business simulation game as an effective method of teaching at secondary school level. Previous research has shown it to be promising method of teaching at college and university level. Serious games have been recognised as an effective tool by various researchers and in many different academic fields. The project was designed to investigate the following problem:

Does learning through simulation will help students better understand the concepts of business.

The project would help in advocating the use of game in education in schools of Pakistan. It aims to improve the learning environment for learners by incorporating games in everyday teaching.

3.5.1 Selecting Variables:

The independent and dependant variables selected were:

Independent variable: Business Simulation Game

The business simulation game was selected as an independent variable because we want to see the effect of this game on the understanding of students.

Dependent variable: Concepts understanding of the students

Understanding has been chosen as dependent variable because it is affected by the independent variable.

3.5.2 Tool used to measure

Pre-test:

A pre-test is used to evaluate the participants at the start of the experiment. Its results are used to confirm that the group needs intervention. In this study the results of the pre-test showed that students have weak business concepts and they need intervention. Had the results of pre-test been different than there would have been no need for an intervention and it could be claimed that students are producing satisfying results.

Post-test:

According to the design of quasi experimental study a post-test is taken by both experimental and control group. The effect of intervention is reflected in the results of post-test of experiment.

Controls and experimental groups are used in a quasi-experimental study to ensure fair result of the experiment. The difference between both groups is that the independent variable is changed for the experimental group and kept the same in the control group. The control group ensures that the study is not affected by other external factors.

3.6 Hypothesis:

The aim of this research was to find out the effectiveness of the business simulation game in a school setting. For this purpose the following hypothesis were created:

The null hypothesis is defined:

HYP_0: use of business simulation game as a tool of learning has no significant impact on the understanding of high school students

The alternative hypothesis is defined as:

Hyp_A: use of business simulation game as a tool of learning has a significant impact on the understanding of high school students

3.7 Selection of Study method:

A quasi-experimental study was chosen for this project as this is one of the most used methods in education research. A pre-test was conducted to ensure that students from control and experimental groups were at the same level. The results were later confirmed with a t-test.

The control group was taught in a traditional manner where no intervention had taken place. The experimental group was taught with the help of a business simulation game.

3.7.1 Selecting variable for testing:

The dependent variable (conceptual understanding) was tested by using pre-test and post-tests. A quiz of 15 questions was designed, with a maximum score of 15 and the total time allowed was 20 minutes.

3.7.2 Designing the conduct of experiment:

The business simulation game was used to teach students in the experiment/treatment group. A pre-test containing 15 questions was conducted to check the level of understanding of students. The treatment groups received two days of play of around 60 minutes whereas the controlled group has the traditional lecture amounting the same time. The treatment/experimental group was first introduced about the game and de-briefed on how to play it and what to expect at the end. They were introduced to the key terms used in the business simulation game and its five stages and what to expect at each stage. Once the students understood the game play they had the permission to play the game for a number of times. One complete game play session was completed in 15 minutes. The students played about three sessions of play on average in one day. The students played the game in groups of

four to five students. Each group had a leader to maintain harmony; all other members were free to assist and suggest in the decision making process. The teacher and researcher were present to assist students at any stage of the game. The test was designed to check the understanding of the business concepts. The test language was English as the school was an English medium school. The questions were general and not specifically related to the game play. At the end of the play a gaming experience questionnaire was also conducted.

	Control group	Experiment group
Intro	10 min	10 min
Pre	10 min	10 min
Game	-	45 min
Post	10 min	10 min

Table 1 implementation

3.8 Details:

3.8.1 Design and implementation of game:

The game covers concepts such as product quality, marketing, sales chart and profits. It has a total time period of 3 years which translates to around 15 minutes in the game. The speed of the game can be adjusted by the students. The students can change different measures such as spending on marketing budget or product price to measure and check their scores in terms of profits. The game also provides virtual assistance to the players by reminding them of about helping scenarios. The students can also view their competitor's data to set their own data and inter-related concepts such as quality and price and market share.

The session for 1 hour was held for 2 days. The game lectures concluded with an informal meeting with both groups where they discussed about the things they had learned over the course of their lecture.

3.9 The business game:

The game is a competitive model wherein the player competes with other competitors in order to achieve a better cash flow and profits. Each team is free to choose from any of the five available products in the game. The next step is to determine the quality of selected

product over set criteria and set up a price for it. The player than determines price, marketing expenses, and production time. The player also determines if there is a need to place in an extra shift to increase the production of the factory.

The player than chooses a distribution strategy from three choices of distribution. This strategy would affect his sales revenue so he has to choose this carefully after discussion with his team mates.

The player also has a competition matrix where he can see his product placement compared to his competitors. This positioning allows him to judge his performance compared to his competitors. The player monitors his monthly sales chart and his cash flow to judge the performance.

The game is spread over a three year time period artificially and can be speed up to be completed in at least fifteen minutes.

Different groups in a class compete with each other to attain a maximum profit and win it. They are at liberty to choose any of the products to use and compete with other students playing the game. To ensure that they win the game they have to create a consistent game plan and change the prices according to the factors affecting the pricing. After completing and playing the game a number of times playing team has a good grip over the factors affecting the game play and their decision making process has improved a lot.

Both the groups were taught the following concepts

- Product features such as quality, finish, packaging etc.
- Pricing
- Competition with other competitors and reading data of other competitors
- Sales chart
- Distribution strategies such as individually or through partners and consequences of choice
- Marketing

3.9.1 Conducting Pre-test and Post-test:

Pre-test was conducted to assess the level of students and their understanding. After Pre-test both groups were taught the concepts mentioned above through different means.

The post-test was similar to the pre-test but there were a few changes such as the order of questions was changed. Also the order of options was changed in a few questions. The level of difficulty and the number of questions was not changed in the post test.

See Appendix for Post-test.

3.10 Screenshots

3.10.1 Setting up the Game:

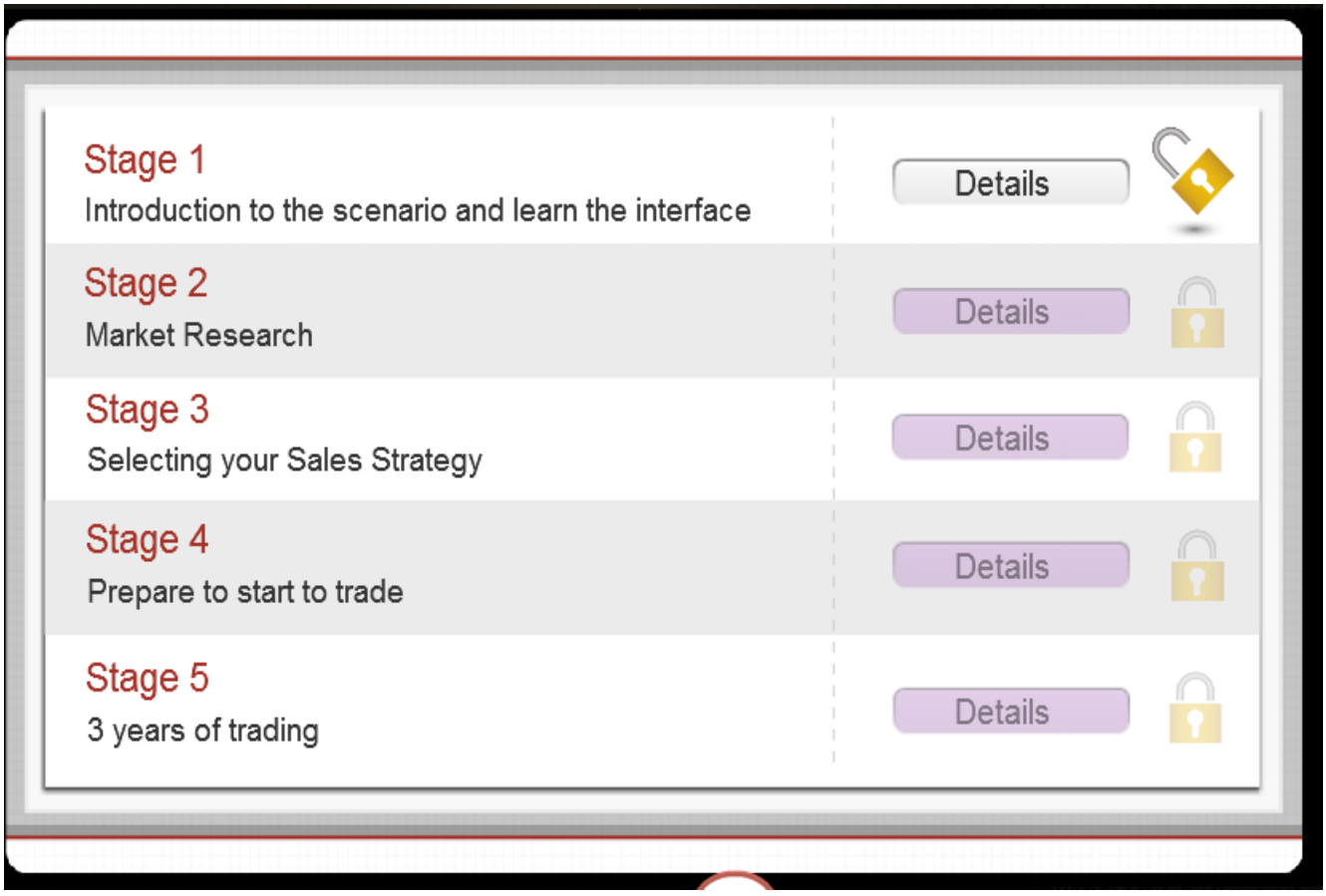
dds

3.10.2 Access to information

The interface of "**MyPC"** provides the access to manage marketing access, financials and production to the players.

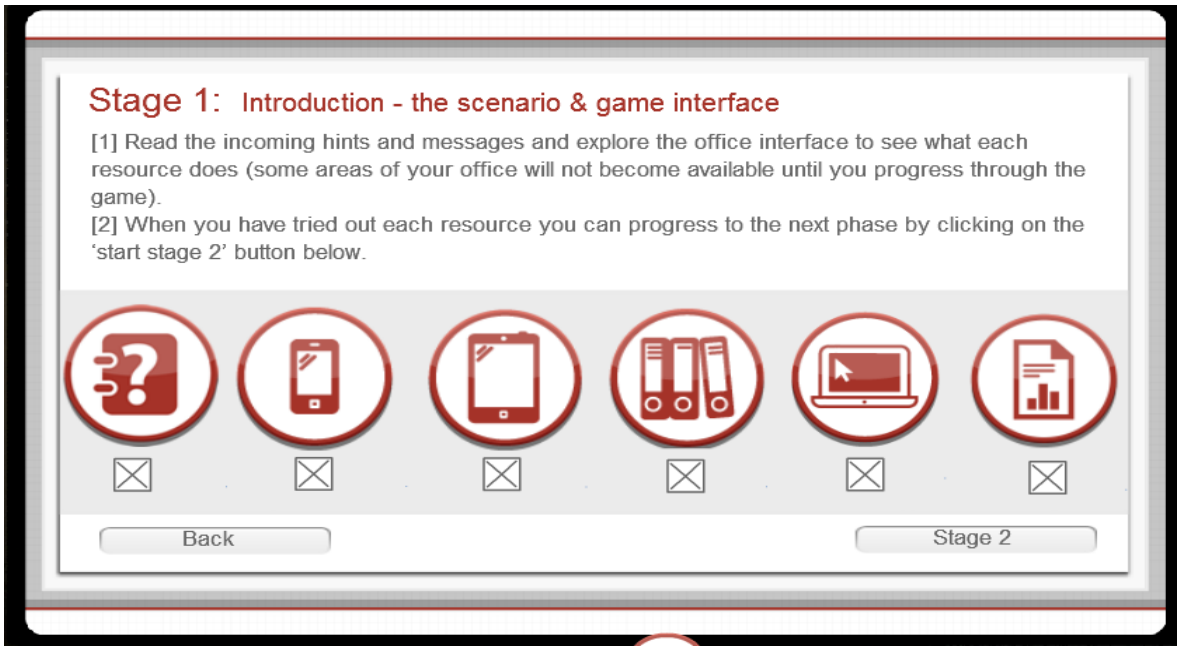
3.10.3 Content:

Understand the stages of business cycle as the game has five stages and each stage has its own goals.



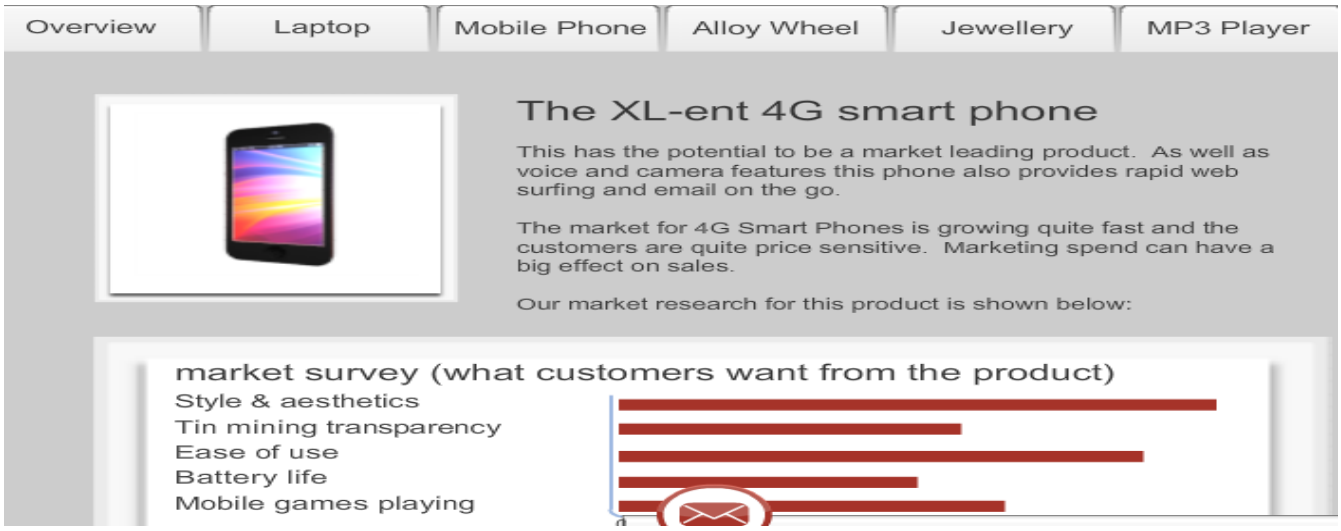
3.10.4 Stage 1: introduction

- Students are introduced to the scenario and they learn about the interface.



3.10.5 Stage 2: Product selection

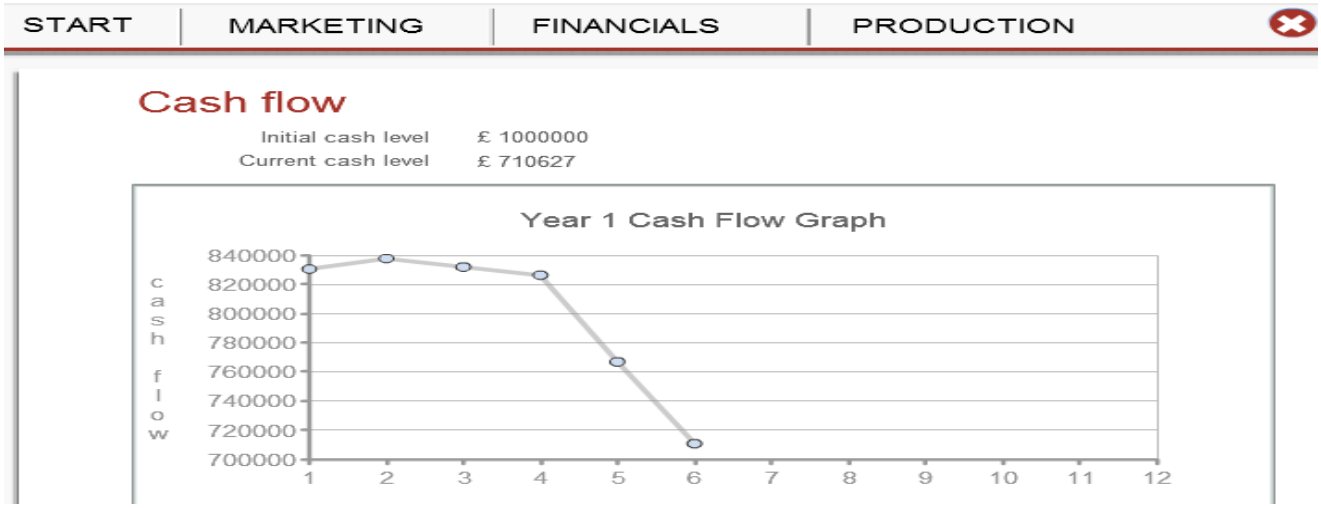
- In this stage they are introduced to the products and the student select one of the product to be sold.
- They are introduced to factors such as market research about the products and the factors on which the research is based.

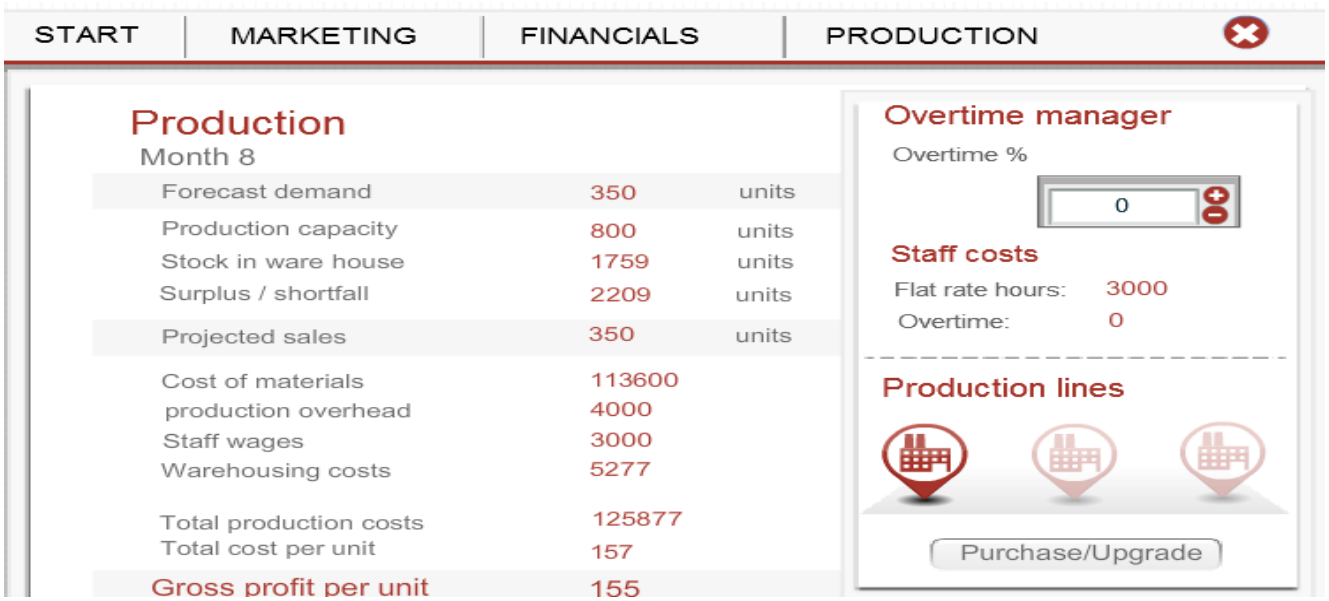


3.10.6 Stage 4: Demonstrates different concepts

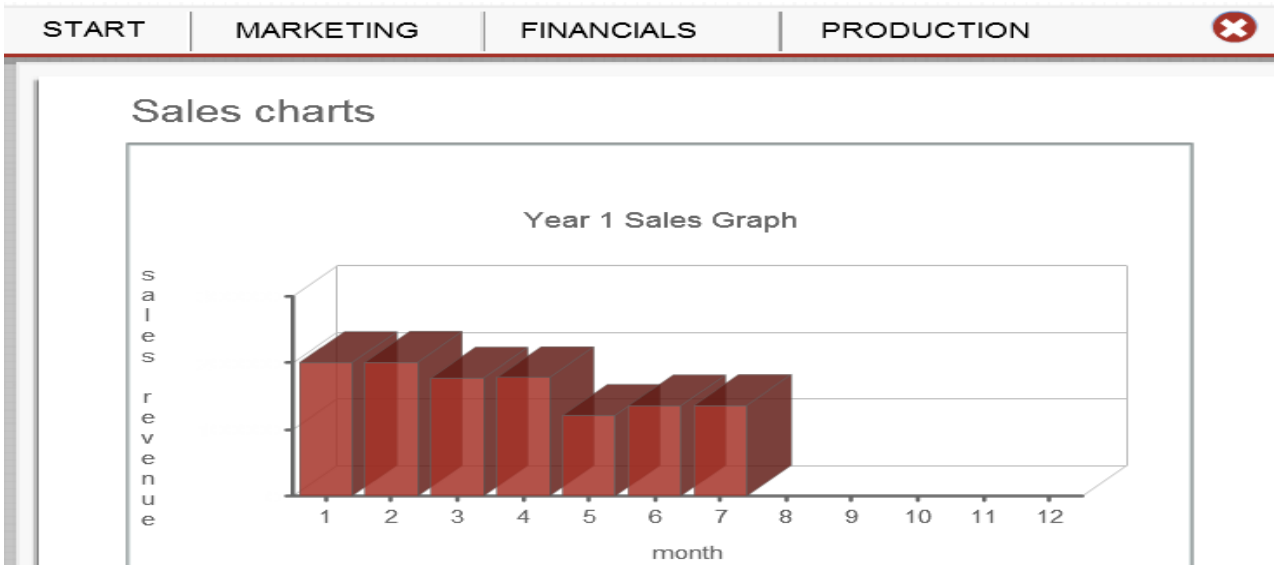
In this students practice marketing, financials and handle production issues.

Students interact with each aspect and see how their decision is affecting their current results.



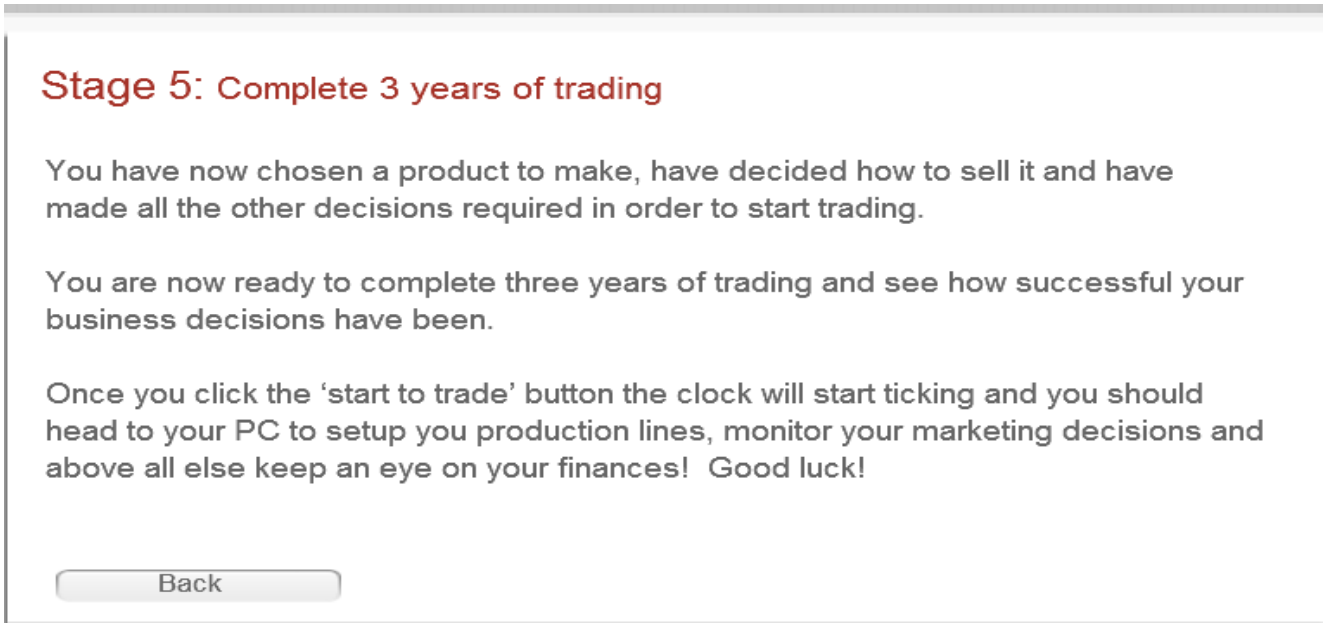


- Once the game has started students can see their sales chart which demonstrates each month sales.
- By viewing this students can go back and change their pricing or other strategies to view the effect on the sales.

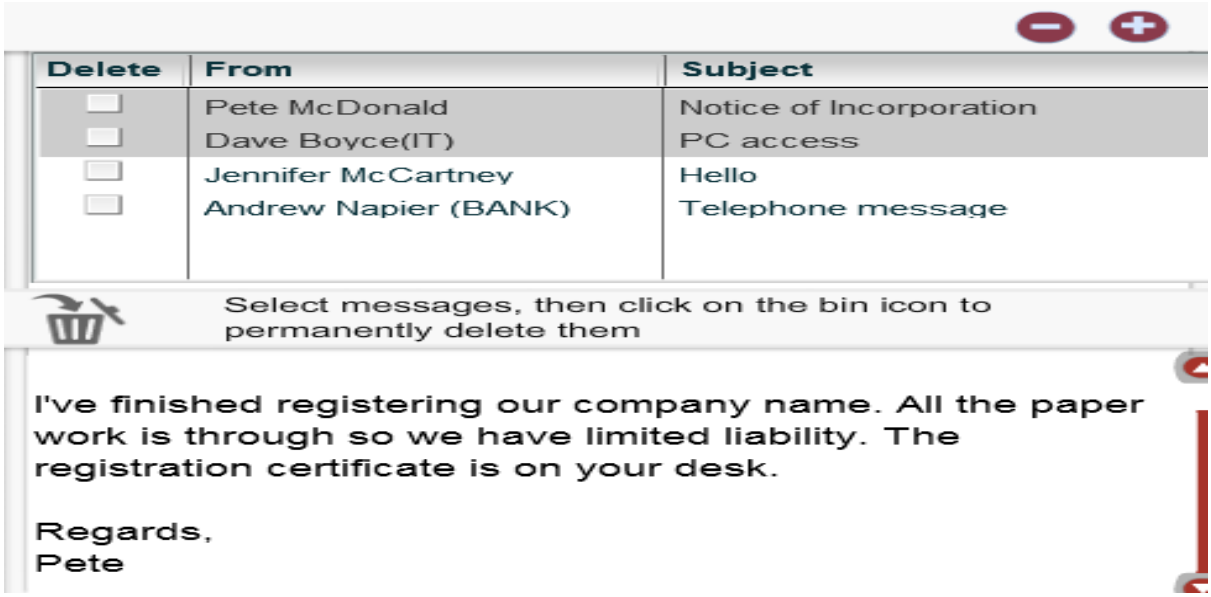


3.10.7 Stage 5

Completion of stages



Game has mentors and virtual help provided in the form of IT manager, bank and other personnel.



3.10.8 Game Reward

On successfully completing the game the student is awarded a car or other items as a reward for participating in the game.

4. Intervention Images

Figure 3 post-test

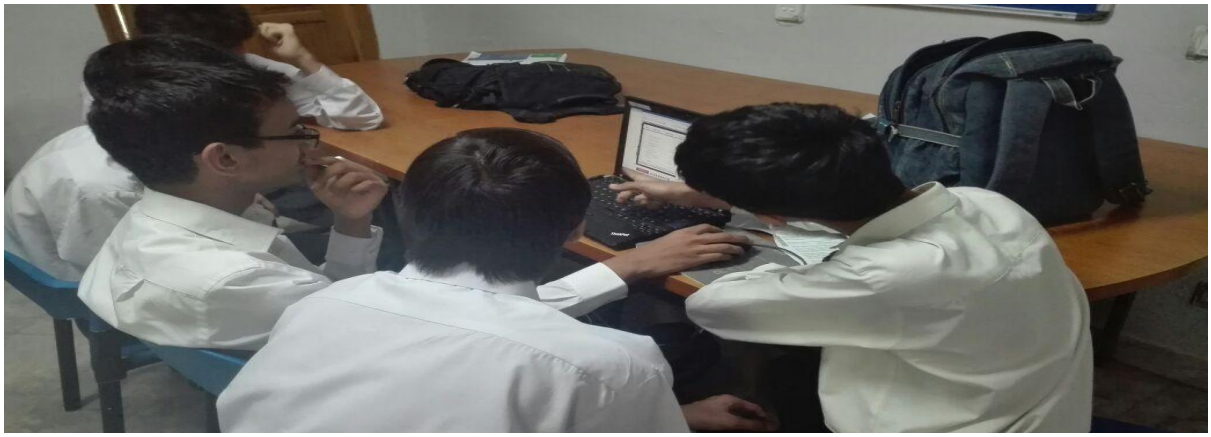


Figure 4game play by students 1

Figure 5game play by student 2

Summary:

A pre-test post-test study design was used in to conduct the study. A group size of 30 students was used in each case. The students belong to a local school and convenience sampling was used.

5. Data Analysis

This chapter presents the quantitative analysis of data collected during and after the intervention. This study was an attempt to ascertain the use of business simulation game in school settings. A quasi-experimental study was designed and the details of the study are mentioned on the following sections.

5.1 Data collected

Data was collected during the exercise and was tabulated. Later on statistical analysis tool SPSS was used to interpret the results. As our population sample was greater than 60 a T-test was applied. As stated in the previous section we have used convenience sampling which is a type of sampling that involves the sample being drawn from that part of the population that is available.

5.1.1 Control pre-test data

The relevant results of pre-test are shown below on control group:

Mean:	**4.77**
N	**30**

Table 2 control group pre-test data

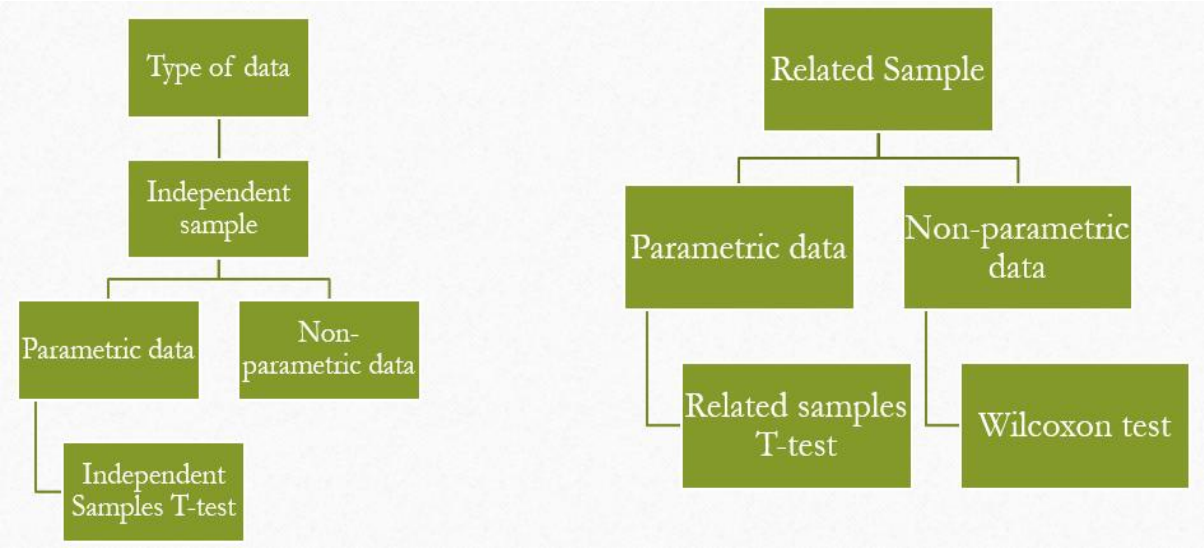
5.1.2 Experimental Pre-test data

The relevant results of pre-test are shown below on experimental group:

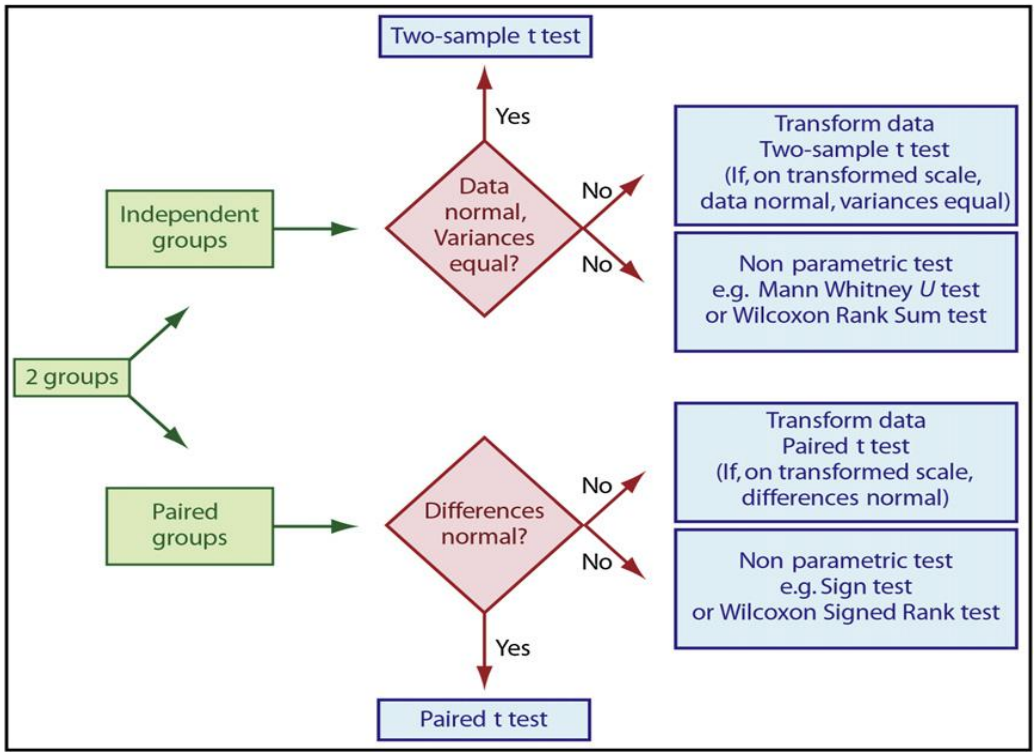
Mean:	**4.73**
N	**30**

Table 3 experimental group pre-test data

5.1.3 Choosing a method for analysis



Before conducting statistically analysis it is important to choose correct test according to the data. The following figure shows the test chosen for the test.



5.2 Post Test data

5.2.1 Control Post-test data

The relevant results of pre-test are shown below on control group:

	Statistics	Standard Error
Mean	6.3667	.26903
95% Confidence Interval (Lower Bound)	5.8164	
95% Confidence Interval (Upper Bound)	6.9169	
Median	6.0000	
Variance	2.171	
Std.dev	1.47352	
Minimum	4.00	
Maximum	9.00	
Range	5.00	
Interquartile	2.25	
Skewness	.211	.427
Kurtosis	-.432	.833

Table 4 control group post-test data

5.2.2 Experimental Post-test data

The relevant results of pre-test are shown below on control group:

	Statistics	Standard Error
Mean	9.0000	.26695
95% Confidence Interval (Lower Bound)	8.4540	
95% Confidence Interval (Upper Bound)	9.5460	
Median	9.0000	
Variance	2.138	
Std.dev	1.46217	
Minimum	6.00	

Maximum	12.00	
Range	6.00	
Interquartile	2.00	
Skewness	.000	.427
Kurtosis	-.738	.833

Table 5 experimental group post-test data

Related vs. independent

Related samples are those samples which come from the same group where as independent set of data comes from two different groups.

The research study consisted of two groups; control group and experimental group and the data came from both the groups making it an independent data study.

Parametric test vs. non-parametric test:

Different types of tests are used for parametric and non-parametric test. Parametric test is use when the data is similar to the normal distribution of data. Secondly the variance of data is similar to each other.

5.3 T-test

A T-test is used to determine the reason behind the difference of mean between the two groups. A difference is considered meaningful if it is significantly larger.

Since our data came from two different groups so it's considered as an independent data.

Before running a T-test data has to be checked for normality and homogeneity of variance.

5.3.1 Test for Normality:

The test for normality is run to check if the data is normal or not. The test used to check normalcy is Shapiro-Wilk test.

5.3.2 Shapiro-Wilk test:

Test for checking normality is Shapiro-Wilk test. This test is used if the size of data set is between 0 and 2000. Since our data set is equal to 60 pupils which meets the requirement of Shapiro-Wilk test we applied it to check for normality of data.

Shapiro-Wilk test has two conditions:

- P-values (sig) <= 0.05 than null hypothesis is rejected
- P-values (sig) > 0.05 than null hypothesis fails to reject

In this test p-value for both experimental group is greater than P(.05). It can be concluded that null-hypothesis is not rejected and it is normally distributed.

	Statistic (W)	**Df**	**P value (sig)**
Control Post-test	.958	30	.074

Table 6 shapiro wilk test for control post test score

p-value for control group is 0.074 which is greater than p(.05) and w is 0.9 which is close to 1. Thus, it can be concluded for the control group that null-hypothesis is not rejected and data is normally distributed.

	Statistic (W)	**Df**	**P value (sig)**
Experimental Post-test	.937	30	.280

Table 7 shapiro wilk test for experimental post test score

Similarly p-value for experimental group is 0.280 which is greater than p(.05) and w is 0.9 which is close to 1. Thus, it can be concluded for the control group that null-hypothesis is not rejected and data is normally distributed.

5.3.3 Leven's test:

Leven's test is carried out to confirm the homogeneity of variance or spread of data which is the second condition for normalcy of data. If Leven's test result is less than ($p<0.05$) then data does not show homogeneity of variance.

Whereas if the result of Leven's test is ($p>0.05$) than data shows homogeneity of variance.

post-test	.140	.710

Table 8 leven's test score for post-test

P value (sig) for Leven's test is .710 (p>0.05) hence it is concluded that post-test scores for both control and experimental group show homogeneity of variance.

5.3.4 Effect size

Another technique to check the presence and magnitude of phenomenon is effect size. Effect size is the extent to which the phenomenon being investigated is present, or the degree to which a null hypothesis is not supported. It tells how big the effect of the intervention commonly used index for effect size is delta. Effect size measured by calculating (mean of experimental – mean of comparison) / standard deviation of the control group

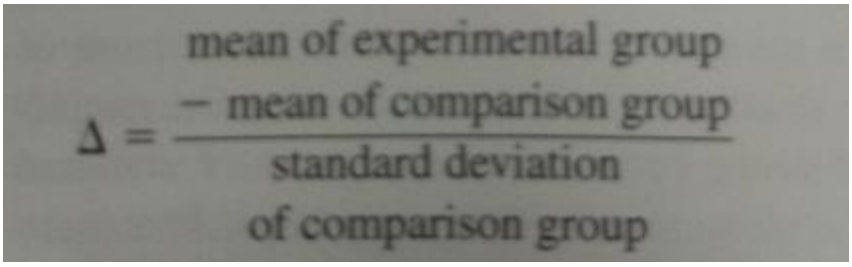


Figure 6 formula for effect size

Effect size ranges are given below:

- 0-0.20 weak
- 0.21- 0.50 modest
- 0.51- 1.00 moderate
- >1.00 Strong

Any effect size greater than 0.5 is considered as an important finding.

(9.0-6.36)/1.47= 1.79

The effect size of 1.79 is a strong effect size.

5.3.5 T-test results:

An independent test was run as our data was normal according to Leven's and Shapiro-Wilk test results which mean it is parametric data. The output of the test is shown below.

	T	Df	Sig P value (2 tailed)	Mean Difference	Standard Error Difference	95% Confidence Interval of the Difference	
						Low	Upper
Post test	6.948	58	.000	2.63	.379	1.9	3.39

Table 9 output of independent samples T-test

Post-test scores from both control and experimental group were taken and T-test conducted to see the averages between both samples. The difference between averages should be large enough.

As the table demonstrates the value of statistical difference is less than $p < 0.05$ hence we can state that null hypothesis is rejected and there is greater chance that use of business simulation game helps in understanding the concepts of business for school students.

5.4 Evaluation:

The game evaluation involved written examination of students participating in groups. Same examination paper was given to both control and experimental student group. The exams had conceptual questions to judge the students in a fair manner. The exam was graded accordingly and marks were compared of both experimental and control group.

An independent sample T-test was used to investigate. The mean test score of experimental group increased from 4 to 9 which shows better understanding from the students. A strong

effect size showed that game had a positive impact on the students and their performance. Thus confirming the alternative hypothesis that: *use of business simulation game as a tool of learning had a significant impact on the understanding of high school student*

6. Discussion

The aim of this research was to evaluate the use of business simulation game in school settings and how it can be an effective tool in increasing the understanding of students of school.

6.1 Observation on operation of game:

The aim of game based intervention was to identify whether it performs an effective role in helping students understand the concepts of business. Previously, the students found business concepts boring and hard to grasp.

The results demonstrated that business simulation game enabled students to experience the real business environment and made their decision accordingly. They acquired skills to make strategic decisions and understand financial results. They also understood that how different elements depends and effect each other in a business environment; like changing product price directly effects the demand of the product in the market. Majority of the students had reflected that simulation had led to a better understanding of the business concepts. The results of the game were evidence of this observation.

The data of this study also confirmed earlier studies conducted in different environments such as colleges, university and companies that simulation is a useful and helpful way of imparting business skill and understanding the practical implications of their decisions.

The analysis showed that: the mean of experimental group increased from 4 to 9 which reflected a better understanding.

The students who had gone through treatment had a better understanding of the concepts of business by playing the game repeatedly as it gave them a chance to understand the concepts being taught in the game and build knowledge connections.

The students of experimental group played through business simulation and were more confident in answering of decision based question compared to the students who had not experienced the simulation.

The intervention was carried out with experimental and control group. The treatment group was encouraged to look into future and see the consequences of their decisions. Each student played different roles in collaboration and worked towards building a team.

6.2 Limitations:

The results of this study encouraged the use of game as a tool to be used in learning business concepts. However, there were several limitations to the study. The study did not look into whether gender difference was affecting the results or making a homogenous group improved the results given the cultural sensibilities of Pakistan.

The second limitation was the time allocated to the study because the study was conducted over a short period of time. For a better and more comprehensive understanding the study should be conducted repeatedly and for a larger audience.

Thirdly the study could have been more strengthened by increasing the sample size and including public schools as well. This study was confined to private schools.

Lastly other aspects such as teacher's perception in games should be looked into detail and what difficulties if any they have experienced. Skill improvement in students should be studied in detail to prove the games as a substitute or a well thought out solution for learning.

More resources should be provided like extra computers etc. to use the time more effectively.

7. Conclusion

The game experiment led us to believe that use of simulation games while teaching business has advantages as a tool of learning. Students focus and decision making skills improved. It was also observed that game based learning improved their team-building capabilities.

Previous research had shown that game-based learning in business teaching has been effective at corporate, college and university level. Not many studies were conducted at the school level to look into the effects of business game at school level. Due to the complex & interlinked nature of business topics game based learning methodology has proved to be effective methodology.

The study also demonstrated that students were highly engaged due to factors such as interaction and the generation of reports in the games. The students had to keep an active eye in order to show a good performance and win the game. The improved understanding reflected in the Post test results. The increased interest in learning was promising for future development of more games for the subject of business.

A quasi-experimental study was conducted to probe the impact of business game in the understanding of concepts among high school students. The pre-test post-test study was used as research method. Data results showed improved in the post test and thus null hypothesis was rejected and alternated hypothesis failed to reject. It was concluded that use of simulation game has a positive impact on the understanding of concepts on the students. There is a real need for schools and wider community to adopt these practices in their everyday learning to engage and teach more effectively so the students can have a better understanding of the concepts being taught to them.

8. Future recommendation

Serious games, game based learning and other form of gamification in learning environment is being researched extensively for use in education. Policy makers in Pakistan should also actively pursue this methodology in their localised environment to set guidelines for the teachers and academics. Game based learning can provide better learning opportunity to the learners. We should look into the use of games in other subjects like science, math and technology. Studies have shown promising results in other subjects as well.

Better learning environment is essential for Pakistani students to succeed in education. If we provide an engaging environment to the learners it will increase their motivation for learning and improve their cognitive abilities as well. This can also increase their presence in school and help teachers deliver their lectures in an effective manner.

Serious games can help teachers in improving their class environments and develop critical thinking skills in their students by using this methodology. This also gives a chance to learners to practice the game freely to improve their skills over time and build knowledge connections. The students can assess their progress as well. Policy makers should make investments in this area to achieve the above mentioned targets.

Teachers in both private and public institutes should take on independent studies and implement different serious games to further speed up the use of games. This will also highlight the importance of serious games for school administrators.

This study indicates that there is a lot of room for research at school level and more such studies can expose us to better insights into adopting better practices in implementing game based learning. The future studies can also look into resolving the obstacles in game based learning and specifically adopting it for business teaching. Labs and classrooms should be equipped with appropriate technological material such as laptops and tables so that serious games as a tool can be used effectively.

A more extensive game and strategy should be adopted to cover the syllabus and activities in order to create a balance of teaching in classrooms. The policy makers should seriously pursue serious games as an alternative method of learning and promote it on a wider scale. There is also a need for dialog among game developers and teachers in order to produce better games and which are flexible and can be used at multiple times. Games developers should also involve students in the process as they are important stake holders in this process.

9. References

Abida Ellahi, B. Z. (2017). A Study of Supplementing Conventional Business Education with Digital Games. *Journal of Educational Technology & Society*.

Aldrich, C. (2005). *Learning by doing: The Comprehensive guide to simulations, computer games, and pedagogy in elearning and other educational experiences.*

Anissa All, E. P. (2015). Assessing the effectiveness of digital game-based learning: Best practices. *Computers & Education*.

Barišić, A. F. (n.d.). Business simulation as a tool for entrepreneurial learning . *EDUCATION FOR ENTREPRENEURSHIP*.

Bellotti, F. B.-M. (2014). Game based learning for 21st century transferable skills: challenges and oppertunities. *educational technology & society* , 1-2.

Björn Berg Marklund, A.-S. A. (2015). *Teachers Many Roles in Game-Based Learning Projects.* University of Skövde, Skövde, Sweden.

Burguillo, J. C. (2010). Using game theory and competition-based learning to stimulate student motivation and performance. *Computers & Education*.

Chen, C.-H. L.-Y. (2018). The Effects of peer competition-based science learning game on secondary students' performance, achievement goals, and perceived ability. *Interactive Learning Environments*.

Cheng, H. N. (2009). Equal opportunity tactic: Redesigning and applying competition games in classrooms. *Computers & Education*.

Cheng, M.-T. L.-W. (2016). Is immersion of any value? Whether, and to what extent, game immersion experience during serious gaming effects science learning. *British Journal of Educational Technology*.

Ching-Huei Chen, J.-H. L.-C. (April 2018). How Competition in a Game-based Science Learning Environment Influences Students. *Journal of Educational Technology & Society*.

Chung-Yuan Hsu, M.-J. T.-H.-C. (January 2017). Surveying In-Service Teachers' Beliefs about Game-Based Learning and Perceptions of Surveying In-Service Teachers' Beliefs about Game-Based Learning. *Journal of Educational Technology & Society*.

Connolly, T. M. (2012). A Systematic literature review of empirical evidence on computer games and serious games. *computers and education* , 661-686.

Cornuel, E. (2007). Challenges facing business schools in the future. *Journal of Management Development*.

Darina Dicheva, C. D. (July 2015). Gamification in Education: A Systematic Mapping Study. *Journal of Educational Technology & Society*.

Dicheva, D. D. (2015). Gamification in education: A Systematic mapping study. *Educational Technology & Society*.

Domínguez, A. S.-d.-N.-M.-S.-H. (2013). Gamifying learning experiences: Practical implications and outcomes. *Computers & Education*.

Doyle, E. B. (2013). Innovative business school teaching: Engaging the millennial generation.

Dumblekar, V. (Jan., 2006). Learning from a Management Simulation: Empirical Research at a Business School in India. *Indian Journal of Industrial Relations*.

Engeström, Y. (1987). Learning by expanding: An Activity-theoretical approach to developmental research. New York, NY:: Cambridge Press.

Farrell, C. (2005). Perceived effectiveness of simulations in international business pedagogy: An Exploratory analysis. *Journal of Teaching in International Business*.

Fu-Hsing Tsai, K.-C. Y.-S. (2012). Exploring the F actors Influencing Learning Effectiveness in Digi tal Game- based Learning. *Educational Technology & Society*.

Hannafin, M. J. (1992). Emerging technologies, ISD, and learning environments: Critical perspectives. *Educational Technology Research and Development*, 49-63.

Hwang, G. J. (2012). Advancements and trends in digital game-based learning research: a review of publications in selected journals from 2001 to 2010. *British Journal of Educational Technology*.

Hwrang, H. B. (2001). A Modern Simulation Course for Business Students. *Interface, vol 3* , 66-75.

Jenkins, k. s. (2003). Harnessing the power of games in education.

Jhon Bransford, A. B. (2000). How people learn: Brain, mind, experience, and school.

Juo-Lan Li, H. v. (2010). Does Collaborative Self-debriefing Scaffold Digital Game-based Learning Better than Individual Self-debriefing Does ? *Educational Science and Technology*.

kapp, K. M. (2012). *The Gamification of learning and instruction: Game-based methods and strategies for training and education.*

Ke, F. (2016). Designing and integrating purposeful learning in game play: A Systematic review. *Educational Technology Research & Development*.

Kenneth Zantow, D. S. (Dec., 2005). More than Fun and Games: Reconsidering the Virtues of Strategic Management. *Academy of Management Learning & Education,*.

Kercher, L. (MAY, 1983). A Business Simulation as an Exploratory Course. *Middle School Journal*, Vol. 14, No. 3.

Kevin Corti. (2006). Gamesbased Learning; a serious business application.

Kiili, K. (2005). Content creation challenges and flow experience in educational games: The IT-emperor case. *The Internet and HIgher Education*\.

Leemkuill, H. (2012). Adaptive Advice in Learning With a Computer-Based Knowledge Management Simulation Game. *Academny of managment*.

li, J. l. (2010). *Does collaborative self-debriefing scaffold digital game-based learning better than individual self-debriefing does.* twente.

Lorenza S. Colzato, W. P. (2012). Action video gaming and cognitive control: playing first person shooter games is associated with improvement in working memory but not action inhibition. *Psychological Research*.

Marc Prensky. (2001). Fun, play and games: What makes games engaging. In Digital game-based learning.

Marklund, B. B. (2014). Teachers' many roles in game-based learning projects. *In Proceedings of the 9th European Conference on Games Based Learning ECGBL*, (pp. 359–367).

Martin Ebner, A. H. (2007). Successful implementation of user-centered game based learning in higher education:An example from. *Science Direct : computer and education* .

Mazeyanti Mohd Ariffin, A. O. (2014). Evaluating game-based learning effectiveness in higher education. *social and beavioral sciences*, 20-27.

McDaniel, R. &. (2009). Best practices for integrating game-based learning into online teaching. *Journal of Online Learning and Teaching*, 424-438.

Michael Zyda. (2005). *From Visual simulation to virtual reality.* USC Information Sciences Institute.

MikeDobson, D. D. (2005). From real-world data to game world experience: Social analysis methods for developing plausible & engaging learning games. *Proceedings of DiGRA 2005 2nd International Conference,"Changing Views: Worlds in Play"*, (pp. 1-14).

Nergiz Ercil Cagiltay, E. O. (2015). The Effect of competition on learning in games. *Computers & Education*.

Niedereichholz, J. (n.d.). Business Simulation and Management Decisions. *Management International Review, Springer*.

Nienke Vos, H. v. (2010). Effects of constructing versus playing an educational game on student motivation and deep learning strategy use. *Computers & Education*, 127-137.

Ozcelik, E. C. (2013). The Effect of uncertainty on learning in game-like environments. *Computers & Education*.

Pannese, L. &. (2007). Games and learning come together to maximise effectiveness: The Challenge of bridging the gap. *British Journal of Educational Technology*.

Papastergiou, M. (2009). Digital Game-Based Learning in high school Computer Science education: Impact on educational effectiveness and student motivation. *Computers & Education*.

Patrick Buckley, E. D. (July 2017). Game On! Students' Perceptions of Gamified Learning. *Journal of Educational Technology & Society*.

pelletier, M. O. (2004). Activity theory and learning from digital games: Implications for game design. *Proceedings of Digital Generations: Children, young people and new media.* NJ.

Popescu, M. M. (2013). Serious games for serious learning using SG for business, management and defence education. *International Journal of Computer Science Research and Application*.

Prensky, M. (2008). The Role of Technology in teaching and classroom. *Education and Technology*.

R Davies, S. R. (2010). An investigation of the effect of educational background on performance in simulation. *The Journal of the Operational Research Society*.

R. Michael, D. &. (2006). Serious Games: Games That Educate, Train, and Inform. .

Rondon, S. S. (2013). Computer game-based and traditional learning method : A Comparison regarding students' knowledge retention. *BMC Medical Education*.

Rosemary Garris, R. A. (2002). Games, motivation, and learning: A Research and practice model. *Simulation & Gaming*.

Sara de Freitas, M. O. (2006). How can exploratory learning with games and simulations within the curriculum be most effectively evaluated? *Computers & Education* , 249-264.

Sargent, R. E. (2002). Perspectives on the Evolution of Simulation. *Operations Research*.

Sarit Barzilai, I. B. (2014). Scaffolding game-based learning: Impact on learning achievements, perceived learning, and game experiences. *Computers & Education*, 65-79.

Savill-Smith, A. M. (n.d.). The use of computer and video games for learning.

Schrope, M. (2013). Solving tough problems with games. *Proceedings of the National Academy of Sciences of the United States of America*.

Soman, W. H.-Y. (2013). A Practitioner's Guide To gamification and education.

Srikant D., G. D. (2010). Rethinking the MBA, business education at a Crossroads. *Journal of Management Development*, 451-462.

T. Hainey, E. B. (2011). Gender Differences in Motivations for Playing Computer Games: A Combined Analysis of Three Studies. *5th European Conference on Games Based Learning.* Reading.

Tarja Susi, M. J. (2007). Serious Games , An overview. 28.

Thomas Connolly, M. S. (2008). Towards the Development of a Games-Based Learning Evaluation Framework. In *Games-based Learning Advancement for Multisensory Human Computer Interfaces: Techniques and Effective Practices.*

Thomas M Connolly, M. S. (2006). Using Interactive Technologies in Teaching an Online Information Systems Course. *Informing Science and IT Education Joint Conference.*

VanEck, R. (2006). Digital Game Based LEARNING It's Not Just the Digital Natives Who Are Restless.

Wei, J.-W. C.-Y. (April 2016). Exploring Engaging Gamification Mechanics in Massive Online Open Courses. *Journal of Educational Technology & Society*.

Wilfried Admiraal, J. H. (2011). The Concept of flow in collaborative game-based learning. *Computers in Human Behavior*.

Yien, J. M. (2011). A Game-based learning approach to improving students' learning achievements in a nutrition course. *The Turkish Online Journal of Educational Technology*.

Yi-Wen Liao, Y.-S. W. (2011). Investigating the Factors Affecting Students' Continuance Intention to Use Business Simulation Games in the Context of Digital Learning. *International Conference on Innovation, Management and Service.*

Yu-Hui Tao, C. R. (2015). Validating the Learning Cycle Models of Business Simulation Games via Student Perceived. *Journal of Educational Technology & Society*, pp. 77-90.

Yu-Hui Tao, C.-J. C.-Y. (July 2012). Alignment of Teacher and Student Perceptions on the Continued use of Business. *Journal of Educational Technology & Society*.

Zafar, B. M. (2014). Game-based learning with native language hint and their effects on student academic performance in a Saudi Arabia community college. *Journal of Computers in Education*.

Zahira Merchant, E. T. (2013). Effectiveness of virtual reality-based instruction on students' learning outcomes in K-12 and higher education: A meta-analysis. *Computers & Education*.

10. Appendices

Pre-test

Business game

1) Who are company stakeholders?
   a. Customers
   b. Shareholder
   c. Owners
   d. All of them

2) Who should your business be responsible to?
   a. Customer
   b. Market
   c. Supplier
   d. All of above

3) Do businesses use a lot of natural resources?
   a. Yes
   b. No
   c. I don’t know

4) Who is an accountant?
   a. Who manages sales
   b. Who manages cash
   c. I don’t know
   d. All of above

5) How is budget used?
   a. To buy new raw material
   b. For marketing
   c. To pay salaries
   d. All of above

6) What is cash flow?
   a. amount that goes into business
   b. amount that flows out of business
   c. both

7) Who is an investor?

   a. Who gives loan
   b. Who takes a share in business
   c. Who takes a risk

8) Gross profit is:

   a. Difference b/w revenue and cost after deduction
   b. Difference b/w revenue and cost before deduction

9) Market research is conducted to

   a. launch a new product
   b. know what customer want
   c. get insight and analyse a product features
   d. all of above

10) Sales can be done in three ways

   a. True
   b. False

11) Market share is same as market size?

   a. true
   b. false

12) What does a sales chart show?

   a. Sales
   b. Cost
   c. Profits

13) The best channel to sell a mobile phone is

   a. Distributor
   b. Agent
   c. Sale

14) Why do you need your competitors data:

a. To find strengths and weakness
b. To check quality
c. To measure market response

15) Does a high price of product reflects its high quality?

a. Yes
b. No
c. I Don’t know

16) Market share is reflected by

a. Profit
b. Number of employees
c. Revenue
d. All of above

Post-test

Business game

1) Who are company stakeholders?
    a. Customers
    b. Shareholder
    c. Owners
    d. All of them
2) Who should your business be responsible to?
    a. Customer
    b. Market
    c. Supplier
    d. All of above
3) Who is an accountant?
    a. Who manages sales
    b. Who manages cash
    c. I don’t know
    d. All of above
4) How is budget used?
    a. To buy new raw material
    b. For marketing
    c. To pay salaries
    d. All of above

5) What is cash flow?

   a. amount that goes into business

   b. amount that flows out of business

   c. both

6) Who is an investor?

   a. Who gives loan

   b. Who takes a share in business

   c. Who takes a risk

7) The best channel to sell a mobile phone is

   a. Distributor

   b. Agent

   c. Sale

8) Gross profit is:

   a. Difference b/w income and cost after deduction

   b. Difference b/w income and cost before deduction

9) Market research is conducted to

   a. launch a new product

   b. know what customer want

   c. get insight and analyse a product features

   d. all of above

10) Market share is same as market size?

a. true

b. false

11) Does a high price of product reflects its high quality?

a. Yes

b. No

c. I Don’t know

12) What does a sales chart show?

a. Sales

b. Cost

c. Profits

13) Market share is reflected by

a. Units sold

b. Number of employees

c. Revenue

d. All of above

14) Why do you need your competitors data:

a. To find strengths and weakness and improve your own product

b. To check their product quality

Questions	Strongly disagree	Disagree	Don't know	Agree	Strongly agree
I feel confident that I know the basics about working in business					
I am interested in working in the field of business when I leave school					
I know someone who works in a business					
I know what skills are important to work in business					
I would consider setting up my own business					
I feel confident in using a computer and the internet					
I have learned a lot from this game					
I have found the game sessions fun					