International Journal of Social Science Archives

ISSN: 2707-8892

Available at www.ijssa.com

International Journal of Social Science Archives, April - June, 2024, 7(2), 474-493

Learning with Class Learning: Enhancing Education through Gamification

Jahanzaib Bakhtiar[a], Dr Muhammad Salim Javed[b], Humera Abbas[c]

[a]Department of Computer Science IIC University of Technology, Cambodia. [b]Professor in Computer Science Northern College of Nursing Arar Saudi Arabia. [c]Department of Economics, Government Post Graduate College for Women Mardan, Khyber Pakhtunkhwa Pakistan

[*]**Email:** humeeraabbas2002@gmail.com

***Abstract*:** In recent years, there has been a lot of interest in gamification in education because it has proved to be a powerful way to engage students and improve their learning abilities. A new teaching approach combining game-based learning with regular classroom teaching is described in this paper. This new way of teaching is meant to create a synergistic learning environment where students not only learn about school topics but also learn important life skills through interactive and immersive games. Play Games in Class to Learn Learning understands that education has many different parts and tries to go beyond the limits of traditional ways of learning. By putting well-designed educational games into the classroom material, teachers can get students more involved and help them think creatively, and critically, solve problems, and work as a team. These games are carefully made so that they meet educational goals and keep learning as the main goal. The chosen survey form is a questionnaire. It would be very time-consuming to interview all 431 students for the survey. Moreover, it was anticipated that not all students would wish to be interviewed, which would make the data less representative as not all students would wish to be interviewed. Interviews and surveys may frighten some pupils. Students don't have time for extensive group conversations; thus they can't be used for surveys. Many factors contribute to the difficulty of achieving real results from group discussions. Through the integration of gamification into conventional pedagogical approaches, educators possess the capacity to cultivate learning environments characterized by dynamism, engagement, and efficacy. Such environments equip students with the necessary tools for achieving academic triumph and enable them to confront the multifaceted challenges of the contemporary era. The proposed novel methodology exhibits considerable potential in revolutionizing the trajectory of education, thereby equipping learners with the necessary tools to cultivate enduring problem-solving skills, adaptability, and resilience throughout their lives.

Key words: Game Learning, Class Learning, Gamification

1. Introduction

Numerous scholars assert that the inclusion of fundamental concepts such as "agency," "immersion," "intrinsic motivation," and "fantasy" is crucial in fostering active student engagement within the context of learning activities, whether they pertain to educational games or more broadly applicable educational practices. As a result, games override the onus of assessment, juxtaposition, and rivalry within an educational setting, permitting the player to indulge in a valuable and profound educational experience within a secure environment. However, in terms of implementing these concepts and effectively engaging their users, instructional games often fail to meet expectations. Educational games designed to teach programming often exhibit a lack of immersive environments, and insufficient gameplay elements, and occasionally require a prerequisite understanding of syntax or coding

concepts. The growing prevalence of computers and programming in everyday life has necessitated a comprehensive proficiency in the field of computer science. Consequently, it is imperative to introduce this material to young children through the utilization of suitable visual metaphors and an ample amount of intrinsic motivation.

The present study was conducted to assess the impact of game-based learning on learning outcomes. To accomplish the objectives, the researcher collected secondary data from various online sources, including journal articles and research papers. The purpose of this data collection was to thoroughly investigate the process of gaming-based learning and to conduct a comparative analysis of the outcomes between traditional learning systems and game-based learning systems. The present thesis commences by conducting an extensive examination of the relevant literature, thereby establishing a solid foundation for the subsequent research.

1.1 Objectives of the Study

Following this, the study proceeds to delineate the specific objectives that will be pursued, elucidating the inherent benefits associated with game-based learning. Additionally, the thesis expounds upon the systematic approach employed in the development of a particular application, thereby providing a comprehensive understanding of the research methodology. The findings of the study indicate that game-based learning has been shown to enhance problem-solving abilities, coordination, and memory skills, and foster a greater interest in learning. In contrast, traditional educational techniques have been observed to exhibit deficiencies in student motivation and engagement, as well as a limited capacity to develop cognitive capabilities and other essential skills. In the foreseeable future, there is a growing expectation that the utilization of simulations and online games will witness an increase in their application within the realm of education and evaluation. Despite the presence of robust theoretical support, the empirical evidence surrounding the educational and learning impacts of digital games remains inconclusive and contradictory.

This study aims to elucidate the design and evaluation of a learning game specifically developed to introduce children, as young as 10 years old, to the fundamental concepts of procedural literacy and basic programming. The primary objective of this research endeavor is to attain the utmost level of immersion within the game environment. The game is founded upon the fundamental principle of "Comparative study of Programming through game-based and class-based learning" and draws upon the theoretical framework of constructivism. The evaluation encompasses a series of tests aimed at validating the usability, immersion, and motivation aspects of the system. Additionally, an endeavor is made to assess the extent to which the knowledge acquired within the game can be transferred to the comprehension of fundamental programming concepts. The findings derived from these experimental assessments have engendered additional contemplation regarding the plausibility of incorporating novel tiers of intricacy and amalgamating educational assessment within the realm of gaming.

The application of the term "edutainment" has been met with resistance from individuals, most likely as a result of their perception of lesser production quality in edutainment games when compared to commercially accessible video games. This disparity in production quality, along with less interesting gameplay, has contributed to a negative attitude toward edutainment games (Egenfeldt-Nielsen, 2007; Honey & Hilton, 2011). The aforementioned factors can exert an influence on the learning experience, which can result in a reluctance to participate in pre-and post-testing. Learning games have been viewed as a possibly deceptive method to engage youngsters who have previously had disappointing experiences in regular classroom settings, according to the findings of the research conducted by Honey and Hilton (2011). According to Papert (1998) and Egenfeldt-Nielsen (2007), obfuscating the educational goal of a game could make it more difficult to acquire knowledge and turn irrational beliefs into reasonable ones. This is one of the conclusions drawn from a study that was conducted by Egenfeldt-Nielsen (2007).

It is worthwhile, in the context of educational interventions, to investigate the possible impact of introducing a learning game that purposefully hides its instructional goals and closely resembles commercial games in terms of the gameplay mechanics and visual aesthetics they employ. It is possible that by doing so, we will be able to determine whether or not such a method may successfully foster a favorable mindset in learners and lay the framework for experiential learning. Even though the first efforts were made in the 1980s, the educational system continues to place insufficient emphasis on computer literacy and programming education. The current landscape of educational games that are focused on programming training is characterized by a scarcity of possibilities, with limited availability of such resources. This scarcity is a direct result of the limited availability of such resources. In addition, the currently available options in this industry all have glaring flaws in the way that their games are

designed to be played. It is of the utmost importance for children to build their procedural literacy in addition to achieving mastery in essential academic disciplines such as reading, writing, mathematics, and the natural sciences. This is because procedural literacy is the foundation for all other forms of literacy. The ability to comprehend and articulate processes, to actively participate in procedural representation and aesthetics, and to grasp the intricate relationship between culturally ingrained practices of human sense-making and technologically mediated communication are all components of procedural literacy. Procedural literacy can be defined as the capacity to comprehend and articulate processes.

The purpose of this study is to identify a set of design principles that apply to our particular circumstances and then put those concepts into practice in the appropriate manner. After that, the system will investigate how youngsters interact with procedures when they are participating in an immersive learning environment that has been specially crafted for the sole goal of serving this particular function. When we take into account the subject areas of history, geography, citizenship, and religion that are taught in schools, it becomes abundantly clear that there is a severe lack of possibilities for experiential learning. The current model of education used in schools does not place a high priority on the incorporation of students' real-world experiences into their academic curriculum. The most common method, on the other hand, is to disseminate knowledge using reading or listening to it. In this method, topics are most often presented abstractly, disconnected from tangible real-world links. Reading and listening as instructional methods are being investigated in this study to determine whether or not they are compatible with various educational philosophies and to investigate the subtle dynamics that exist between the two. It is essential to highlight that the purpose of this article is not to dismiss these strategies as ineffective ways of teaching; rather, the objective is to conduct an in-depth analysis of the degree to which these strategies are compatible with other educational frameworks. It would appear that the dominant philosophy practiced inside the educational system supports the idea that one may completely avoid the requirement of actively participating in real-world experiences. The pertinent material can be found, as stated by Genfeldt-Nielsen (2007), on pages 94 and 95 of the publication that was cited earlier.

Due to the inherent transparency of learning games about their goals, it is possible to advertise them successfully to a wide variety of stakeholders, including parents, educational institutions, and other audiences in addition to their core target population of children. When youngsters demonstrate an interest in particular games, it is imperative on their part to work toward completing the objectives of such games. On the other hand, individuals have the impression that information that is delivered verbally and is stripped of its context lacks practical relevance to their day-to-day experiences, which makes it less useful for acquiring knowledge about abstract subjects. If the integration of educational content is not carried out with finesse, then the practical value of a learning game may be eclipsed by the sense of just engaging in trivial, abstract tasks presented in a novel fashion. If this is the case, then the practical utility of the learning game may be dominated. As an alternative to the educational content being easily accessible to the user, it has been established that it has been strategically integrated within the gaming challenge. This conclusion was reached as a direct result of the variables that have been identified.

Educational games have the potential to overcome a wide variety of significant barriers to education by encouraging players to adopt a more positive cognitive approach. This opens the door for players to participate in a thoroughly immersive digital setting. It has been suggested that if one were to offer gamers the autonomy to decide their own pace of learning, free from any compared standards with fellow students or the inspection and prospective assessment by educators, then this might potentially increase the level of participation that gamers have with the educational subject.

Python is a high-level programming language that is distinguished by the fact that its syntax is interpreted dynamically during program execution. It employs an object-oriented methodology, which emphasizes the utilization of objects to structure and organize the programming code. Python's high-level built-in data structures, dynamic binding, and typing have shown to be particularly useful for Rapid Application Development (RAD) during the development process. Python also supports a wide range of programming paradigms. This particular programming language is useful in the video game industry as a scripting language, in addition to the core applications that it was designed for. This was discovered after it was already in use. In addition, it has been observed that this language performs the function of an efficient glue, which makes it easier to integrate modules or components that already exist. It is well known that the programming language Python places a strong emphasis on readability and ease of learning, both of which lead to a reduction in the expenses associated with program maintenance. Python's strong support for packages and modules acts as a catalyst for encouraging code reuse and the organization of program modules. This is accomplished through the organizing of program modules into

hierarchies. Both the binary and source code versions of the Python interpreter, along with Python's huge standard library, are freely distributable and accessible for download on all platforms that are commonly used.
The fact that Python is so much more efficient than other programming languages is the sole reason why so many developers are drawn to it. Because the Python programming language does not require a compilation procedure by default, the debugging cycle of the edit test is significantly sped up when the language is used. This is one of Python's fundamental characteristics. Because Python scripts have the favorable quality of being resistant to segmentation faults produced by defects or input errors, they are known for the exceptional ease with which they can be debugged. This is one reason why Python scripts have become so popular. The user is presented with a stack trace if the Python interpreter runs into an error. An exception is thrown if the Python program is unable to successfully address a problem or an unforeseen circumstance after it has been encountered. Python's source-level debugger makes it possible to investigate both local and global variables, set breakpoints, evaluate arbitrary expressions, carry out the sequential execution of code one line at a time, and perform a wide range of other tasks. The employment of Python itself for the development of the debugger is an example that demonstrates the strength of introspection that the Python programming language possesses. Incorporating print statements into the source code of a Python program is an efficient method for debugging a program written in Python. This approach provides a quick and uncomplicated manner of locating and fixing mistakes that may have been introduced into the application. This easy strategy is made more effective by the application of the quick edit test debugging cycle.

1.2 Problem Statement

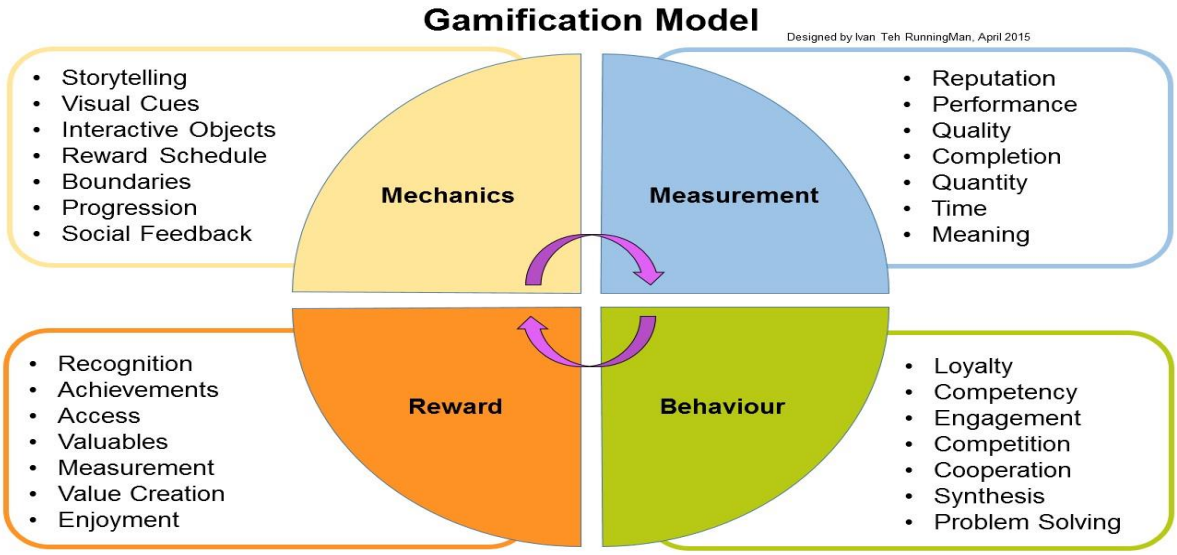
The phenomenon that sees an increase in the popularity of captivating games is gaining speed daily. In the context of Pakistan, it is important to note that there is a limited supply of fun educational games that respond to the needs of young children. This is a problem because there is a large population of young children in Pakistan. The game "Comparative Study of Programming through Game-based and class-based learning" has been designed to generate a method that is very useful for the instruction of the Python programming language. The primary purpose of the game is to educate players about the fundamental concepts that underpin the Python programming language. This is accomplished by designing an interesting game that not only piques the user's attention but also makes it easier for them to learn new things at the same time. The user is allowed to collect items that are connected to a variety of concepts, such as data kinds, variables, and values, as a result of the game's incorporation of components that revolve around such topics as data types, variables, and values. The game has been constructed in such a manner that the player is required to collect the necessary items to effectively respond to the asked questions. To do so, the player must collect all of the relevant items. The many levels of the game are separated into a great number of different data categories. The user is given several objectives to complete while they are immersed in the game world, and they must do so by making use of control and selection statements.
The purpose of this research is to construct a thorough comparison study that looks at the effectiveness of game-based learning about conventional classroom instruction in the field of computer programming education. The argument is presented in two distinct parts: the preproduction segment, and the production section. The first part of the process, called Preproduction, entails the conception of various game concepts and layouts. Because it lays the groundwork for the succeeding stages of game creation, this phase is an essential part of the process. The actual creation and development of game assets is the primary emphasis of the second segment, which is titled "Production." During this stage, the ideas that have been imagined are translated into playable components that will eventually be incorporated into the finished product.

2. Literature Review

The development of a "run and pick up" game that makes use of tilt controls was the major objective of the research study that compared game-based learning with more conventional classroom training for learning programming. It is recommended that the player review the game design document to receive additional explanation. objectives is a consequence of the expansive scope of the project, a wide variety of subject areas were investigated, which resulted in the detection and elimination of a great deal of problematic circumstances. The successful completion of this project was contingent on these problems being solved within an atmosphere of production that placed a premium on collaboration among coworkers. During the pre-production phase of the project, every aspect of the game, including its presentation, was carefully created. At this early stage of the development of this project, exhaustive evaluations have been carried out across all of its components. These evaluations have taken into account the environmental and character design, in addition to the improvement mechanism. The findings that were acquired

provided a coherent and consistent depiction of the ultimate conclusion, building a solid foundation for the rapid and streamlined development of the game. The end outcome was successfully represented by the obtained results. In light of the analysis of several choices and the comprehensive research into various new prospects, a large number of adjustments have been made and put into effect. Despite this, it is essential to keep in mind that the fundamental ideas have not been altered in any way. The discussion that took place over the modifications that were put into action is laid out in detail in the section under "Design Alterations." The current investigation pulled from a pool of games that had been published in the past and belonged to the same category so that it could provide an all-encompassing comparison.

Figure 1



In the process of developing a video game, there are several technical positions, including the following:

Figure 2

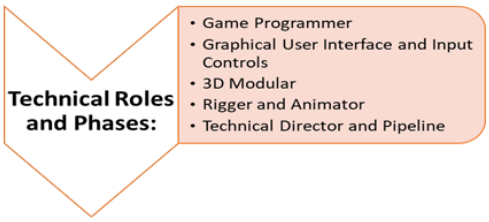
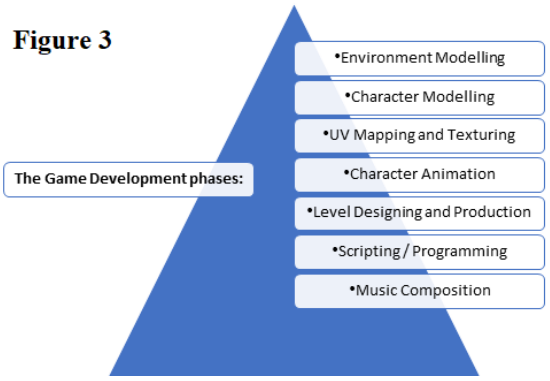


Figure 3



In recent years, there has been a discernible increase in the application of game-based learning, which can mostly be linked to the breakthroughs that have been made in technology. It is anticipated that this pattern will maintain its current positive trajectory, exhibiting rapid growth in the not-too-distant future. Several different industries, including the field of education, have undergone substantial changes as a direct result of the changing technological landscape. As a direct consequence of this, the predominant educational mechanisms have undergone significant alterations that move them further away from traditional methods. Numerous empirical studies have been conducted to investigate the intricate interplay between performance outcomes and the use of game-based learning techniques, as well as to investigate prospective avenues for increasing its efficacy. These studies have also been conducted to investigate potential avenues for enhancing its efficacy. The fundamental purpose of this study project is to conduct an in-depth investigation of the effects that different teaching strategies have on pupils.

The effectiveness of the game-based learning approach has been supported by empirical research, proving that it is superior to traditional methods of training. In addition to that, it has been discovered that this method has a significantly higher capability of motivating and influencing students. According to Papastergiou (2008), even

though it is often known that males tend to be more inclined toward gaming and possess a larger knowledge of computer games compared to women, the influence of game-based learning appears to be similarly influential for both genders. This is even though it is commonly observed that women tend to be less inclined toward gaming and possess a greater comprehension of computer games than men. It has been discovered that the learning process can be facilitated to the same degree for both males and females when using this method of education. The use of game-based learning has seen widespread adoption across a variety of industries, including but not limited to the educational system, the marketing industry, the military, and advertising. Even though the employment of this specific method for instructional purposes has achieved a substantial amount of popularity and is being adopted by a large number of people, additional research is required to completely evaluate its efficacy. Specifically, Ariffin (2013) states that Traditional teaching approaches have been called into question because, according to Prensky (2003), they are unable to effectively engage young students since they do not provide enough intrinsic motivation. Because it does not effectively address the students' cognitive capacities, the educational system is rendered partly useless as a result of the motivation gap that exists inside it.

Figure 4

Figure 5

The requirement of making significant investments in technology and assuring access to up-to-date literature is the key barrier that prevents the widespread adoption of game-based learning. This is also the primary reason why game-based learning is not yet widely used. The traditional methods of acquiring new information do not call for the utilization of computational tools or intensely controlled environments, both of which are resources that are frequently lacking in many educational institutions. The resistance shown by educators is one of the key difficulties that is preventing the broad adoption of game-based approaches. The complex nature of technical infrastructure is another obstacle that is making the adoption of game-based techniques difficult stated by (McFarlane 2004).

2.1 Comparison with Previous Learning Games

2.1.1 Codin Game

The innovative code-learning platform developed by French startup Codin Game has recently secured a significant investment of $1.6 million from Isai. This funding will undoubtedly contribute to the further development and expansion of Codin Game's platform, which aims to revolutionize the way individuals acquire coding skills. Codin Game, as its name implies, primarily focuses on the domain of games. It does not delve into the realms of game development or gamification but rather centers its attention on the pure essence of games themselves. The rationale underlying each exercise is intricately linked to a tangible game, thereby facilitating the provision of visual feedback.

2.1.2 Code Combat

Code Combat is a burgeoning educational gaming enterprise situated in the vibrant city of San Francisco, California. A browser-based video game has been developed to impart the fundamental skills of Python programming to its players. Code Combat, a prominent educational platform, was established in February 2013 by a team of esteemed individuals including George Saines, Scott Erickson, and Nick Winter. It is noteworthy to mention that these individuals had previously demonstrated their expertise in the field of language learning through the development of the highly regarded application known as Skritter.

2.1.3 Screeps

Screeps is a massively multiplayer online (MMO) strategy game that places a heavy emphasis on the scripting

abilities and intelligence of the player, rather than the amount of time invested. To effectively develop a comprehensive empire and successfully conquer the territories of other players, it is imperative to allocate specific resources and assign designated tasks. Achieving success necessitates the attainment of an optimal equilibrium between economic considerations, logistical efficiency, and military prowess, all of which are intricately interwoven and meticulously orchestrated by the individual.

2.1.4 Code Wars

Code Wars, a highly prosperous video game, was developed during the early 1980s by Kevin Flynn, a former programmer at ENCOM.

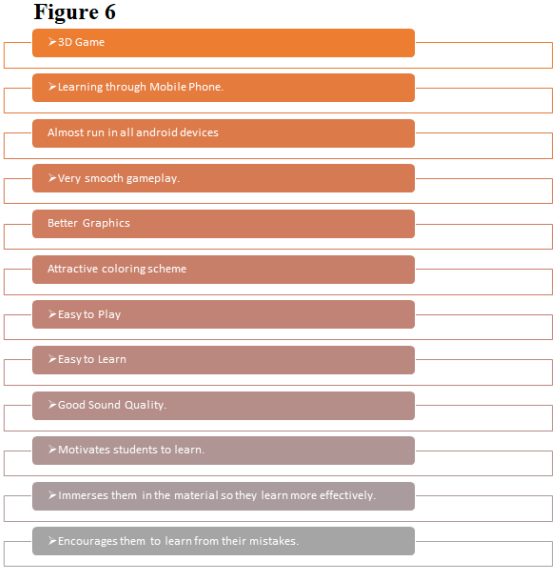
2.1.5 Code kata

A code kata refers to a programming exercise that is designed as a game-like activity, aimed at enhancing a programmer's skills through deliberate practice and repetitive problem-solving. The origin of the term can be traced back to its likely coinage by Dave Thomas.

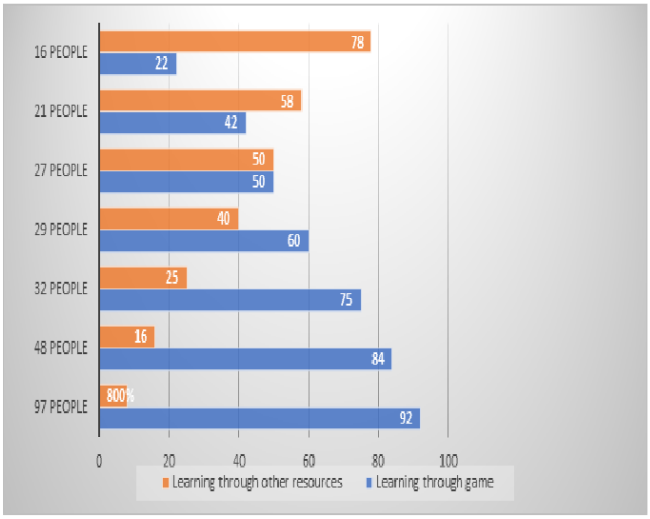
Several previous Python learning games have been developed, such as CodinGame, CodeCombat, Screeps, Codewars, and Code Kata. These games provide interactive platforms for individuals to enhance their Python programming skills. All of the aforementioned games exhibit a two-dimensional visual style, which may present challenges in terms of gameplay accessibility and the acquisition of fundamental Python programming skills. Furthermore, the gameplay experience may not be characterized by seamless mechanics, and the graphical elements employed may not possess a compelling aesthetic appeal. The usage of this application is restricted to desktop devices, thereby excluding mobile phones from its functionality.

2.2 Features of our Game

Figure 6



Survey Graph 1



The present study aims to investigate the effectiveness of learning through game-based approaches compared to traditional learning methods, such as utilizing books and internet resources. A survey was conducted involving a sample size of 270 participants. The primary objective of this survey was to gather data and insights regarding the perceived effectiveness of game-based learning in comparison to other educational resources. The concept of utilizing game-based learning has garnered significant support and approval from various stakeholders.

2.3 What Is AI for Games?

Artificial Intelligence (AI) for games refers to the implementation of intelligent algorithms and techniques within the domain of video game development. AI in games encompasses a wide range of methodologies and approaches that enable computer-controlled entities, such as non-player characters (NPCs), to

At its fundamental essence, the concept of "artificial intelligence" involves the replication of the actions exhibited by other participants or entities within a given game environment. These entities encompass a wide range of elements, including players, missiles, and health pickups, all of which possess the capacity to engage in actions or be subjected to external influences. The fundamental principle underlying this phenomenon is the simulation of behavior. In essence, the utilization of artificial intelligence (AI) in the context of gaming can be characterized as being more focused on the artificial aspect rather than the intelligence aspect. The system can range from a rudimentary rules-based framework to an intricate design aimed at providing a formidable opponent experience, simulating the role of a commanding officer leading an opposing army.

2.4 How AI for Games Differs from Traditional Views on AI?

The distinction between AI for games and conventional perspectives on AI is a subject of considerable interest and investigation. AI for games, also known as game AI, deviates from traditional AI approaches in several key aspects. This response aims to elucidate these disparities without introducing any additional information. Firstly, AI for games is primarily concerned with creating intelligent behaviors within the context of a game environment. Unlike traditional AI, which often focuses on general problem-solving or decision-making, game. The conventional approach to AI research aims to develop a genuine form of intelligence, albeit achieved through artificial methods. Efforts are being made by various research initiatives, including the Massachusetts Institute of Technology's (MIT) Kismet project, to develop an artificial intelligence (AI) system capable of acquiring knowledge, engaging in social interactions, and displaying emotional responses. At present, the Massachusetts Institute of Technology (MIT) is actively engaged in the development of an artificial intelligence (AI) system that aims to emulate the cognitive abilities of a young child. Encouragingly, the ongoing research efforts have yielded promising outcomes thus far.

In the context of contemporary gaming, it can be posited that genuine artificial intelligence (AI) surpasses the fundamental prerequisites of mere entertainment software. The sentience or self-awareness of game AI is not a requirement, and in fact, it should lack these qualities. The primary focus of game AI is limited to the domain of gameplay and does not extend to acquiring knowledge beyond this scope. The primary objective of integrating artificial intelligence (AI) into games is to emulate sophisticated cognitive abilities, thereby presenting players with a plausible and engaging level of difficulty. This level of challenge is designed to be surmountable, allowing players to experience a sense of accomplishment upon overcoming it.

2.5 The Purpose of AI in Games

The purpose of artificial intelligence (AI) in games revolves around enhancing the overall gaming experience by imbuing non-player characters (NPCs) with intelligent behaviors and decision-making capabilities. AI in games aims to create a more immersive and challenging gameplay environment, where NPCs can exhibit human-like intelligence and adaptability.

Artificial intelligence (AI) has demonstrated its ability to assume various roles within the realm of gaming. The concept being referred to is a set of guidelines that are commonly employed to regulate the actions and conduct of various entities within the virtual environment of a game. The consideration of pre-scripted events as a manifestation of artificial intelligence (AI) within entities is an additional perspective to be contemplated. In the context of the game F.E.A.R*, it is worth noting that the presence of a disconcerting young girl, who serves to unsettle players and potentially hint at forthcoming occurrences, can be attributed to a pre-determined sequence of actions within the game's programming. When contemplating the intersection of artificial intelligence (AI) and games, it is common for individuals to associate this amalgamation with the presence of computer-controlled players within multiplayer gaming environments. However, it is important to note that AI has the potential to fulfill various roles, each with its distinct characteristics and functionalities.

2.6 Basic Necessities for AI in Games

The fundamental requirements for the integration of artificial intelligence (AI) in games are of paramount importance in the contemporary gaming landscape. These necessities serve as the bedrock for the development and implementation of AI systems within gaming environments. By adhering to these core principles, game developers can ensure that AI in games operates

The system requirements for an AI can vary significantly depending on the specific role it is intended to fulfill. In certain cases, the system needs may be minimal. As the complexity of a system increases, the corresponding demands placed on artificial intelligence (AI) will proportionally escalate. The fundamental requirements,

commonly referred to as basic needs, encompass the temporal resources necessary for the execution of artificial intelligence (AI) systems. To accommodate more intricate systems, it becomes necessary to incorporate mechanisms for perceiving the artificial intelligence's (AI) environment, maintaining a log of player actions, and establishing a framework for assessing the efficacy of past decisions.

2.7 Decision Making

The fundamental principle underpinning artificial intelligence (AI) revolves around the process of decision-making. To implement these options, the intelligent system must possess the capability to exert influence over the entities through the utilization of the AI system. The execution of this task can be structured using either an "AI push" or an "entity pull" approach.

The prevailing trend in game development is to implement AI push systems that tend to segregate the AI system as an independent component within the game's overall architecture. The implementation of such a strategy frequently manifests as an independent thread or multiple threads, wherein artificial intelligence (AI) dedicates its computational resources to evaluating and determining the optimal decisions based on the available game options. Upon the AI's completion of the decision-making process, said decision is subsequently disseminated to the relevant entities involved in the decision-making scenario. The efficacy of this particular approach is most pronounced within the context of real-time strategy games, wherein artificial intelligence (AI) exhibits a primary focus on overarching strategic considerations.

Entity pull systems have been found to exhibit optimal performance in game environments characterized by the presence of uncomplicated entities. Within the context of these games, the entities actively engage with the AI system by invoking it whenever they undergo cognitive processes or self-updates. The aforementioned approach demonstrates significant efficacy when applied to systems characterized by a substantial quantity of entities, wherein the entities in question do not necessitate frequent cognitive processing, as exemplified by shooter games. The incorporation of multi-threading techniques can potentially enhance the performance of this system. However, it is important to note that the implementation of such techniques necessitates careful consideration and planning. For a comprehensive understanding of the subject matter, we recommend referring to the article titled "Multithreaded AI" authored by Orion Granatir.

3. Research Methodology

The survey design that has been selected for conducting the survey is the utilization of a questionnaire. The administration of the survey via interviews was deemed impractical due to the considerable time investment required to conduct interviews with a total of 431 students. Furthermore, it was acknowledged that not all students would be inclined to participate in the interview process, thereby potentially compromising the representativeness of the data collected. Certain students may experience hesitancy when it comes to participating in interviews or completing questionnaires. Conducting surveys through group discussions is not a feasible approach due to time constraints faced by students, rendering them unable to participate in extensive discussions. Furthermore, obtaining meaningful outcomes from group discussions poses significant challenges.

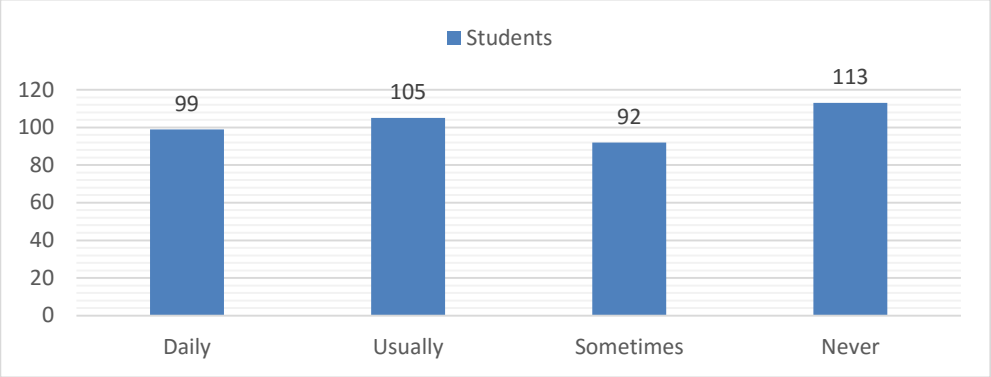
The survey questionnaire is composed of three distinct sections. Section I focuses on the evaluation of students' gaming experience. Section II of the study focuses on the fundamental concepts that students possess regarding programming. This section aims to explore the existing knowledge and understanding of students about programming principles and practices. Moving on to Section III, this segment delves into the experiences of students with traditional learning methods as compared to game-based learning approaches. The objective here is to examine and compare the perspectives and insights of students regarding these two distinct modes of instruction.

4. Result and Analysis

The Research and statistics indicate that a significant proportion of students exhibit a keen interest in engaging with video games. A subset of students refrain from engaging in video game activities due to a lack of interest or a scarcity of available time.

Q1: When do you play video games?

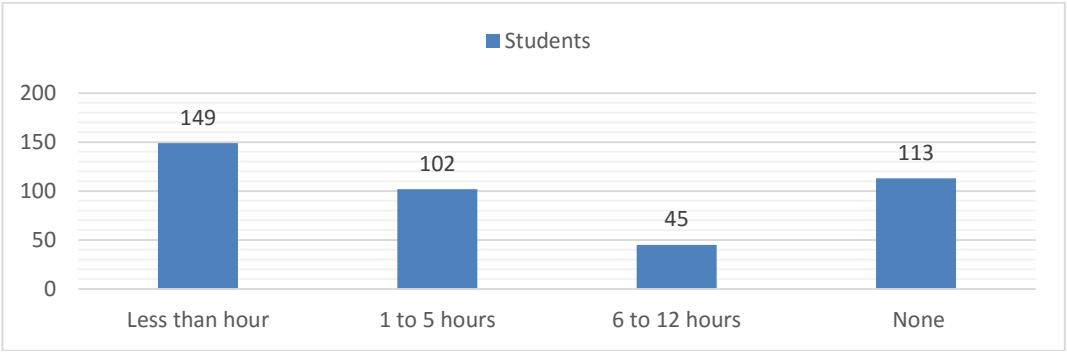
Figure 7



According to the data collected, it has been observed that a total of 113 students exhibit a lack of engagement in the activity of playing video games. The reasons for their lack of engagement in play activities are not readily apparent. The response to this inquiry will be ascertained by referring to Survey Question 1. Among the cohort of students that remains, consisting of a total of 296 individuals, it has been observed that there exists a certain level of interest in engaging in the activity commonly referred to as playing video games.

Q2: I spend the following amount of time per day playing games

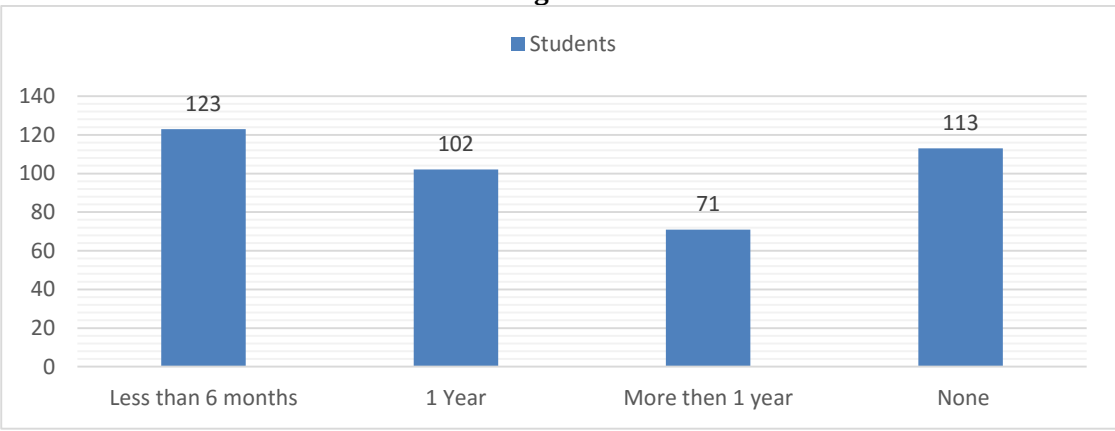
Figure 8



According to our research findings, a significant proportion of students allocate less than one hour of their time to engage in the activity of playing video games.

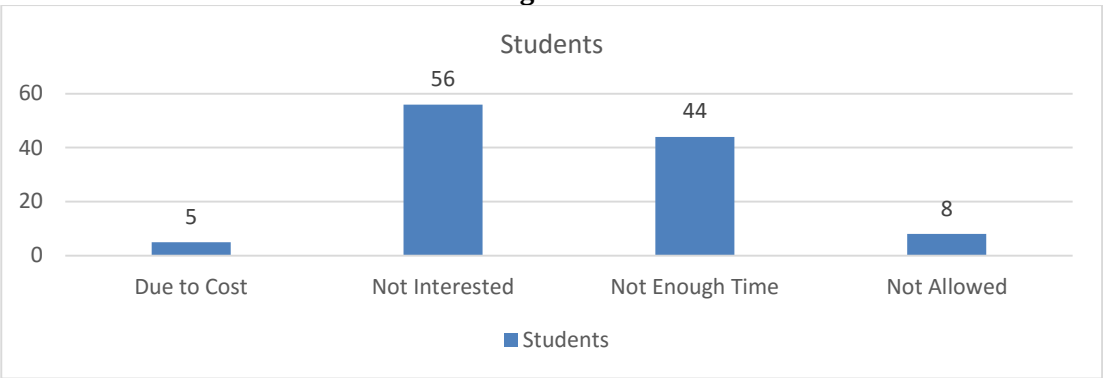
Q3: How long have you been playing video games?

Figure 9



Q4: If your answer was "None" to either question, why don't you play video games?

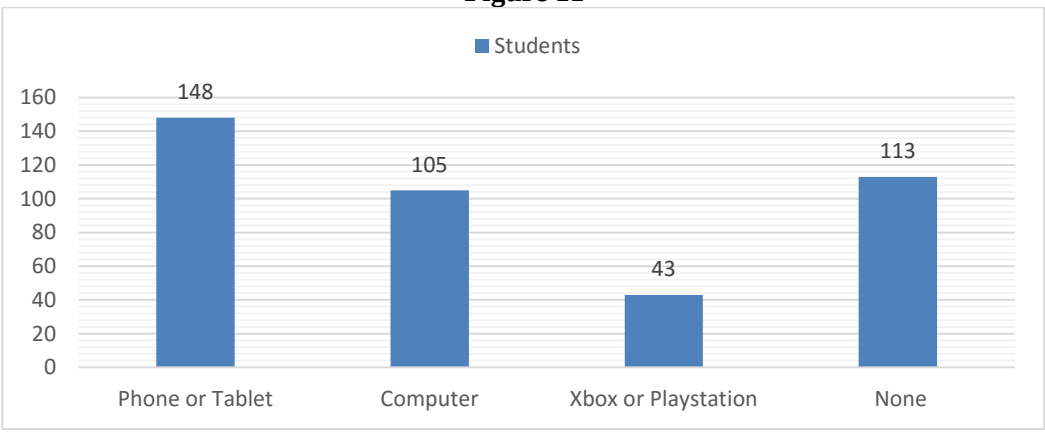
Figure 10



According to our research findings, a significant proportion of students do not engage in the activity of playing video games. Due to their lack of interest in engaging in recreational activities involving games, individuals exhibit a disinterest in participating in such endeavors. It has been observed that a subset of students face constraints that limit their availability to engage in recreational activities such as playing games. It has been observed that a subset of students face restrictions imposed by various authoritative figures, such as parents and teachers, which prohibit them from engaging in recreational activities involving games.

Q5: Please choose how you CURRENTLY play MOST of your games.

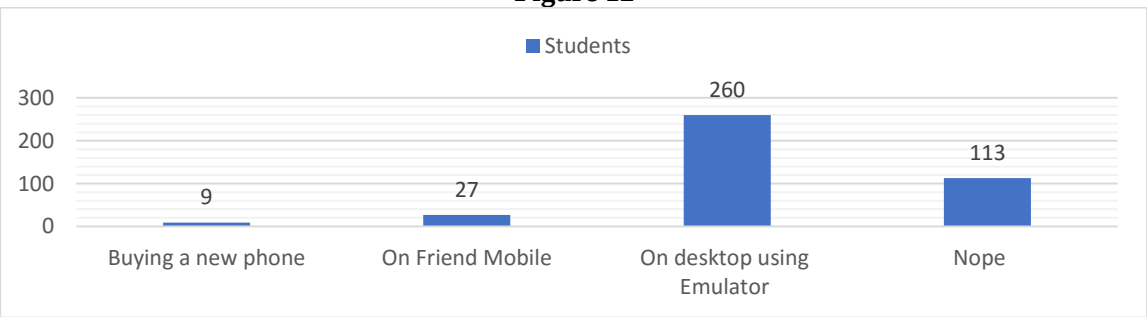
Figure 11



According to our research findings, a significant proportion of students engage in the activity of playing games on their mobile phones or tablet devices.

Q6: If you don't have a smartphone then how you will play code fun?

Figure 12

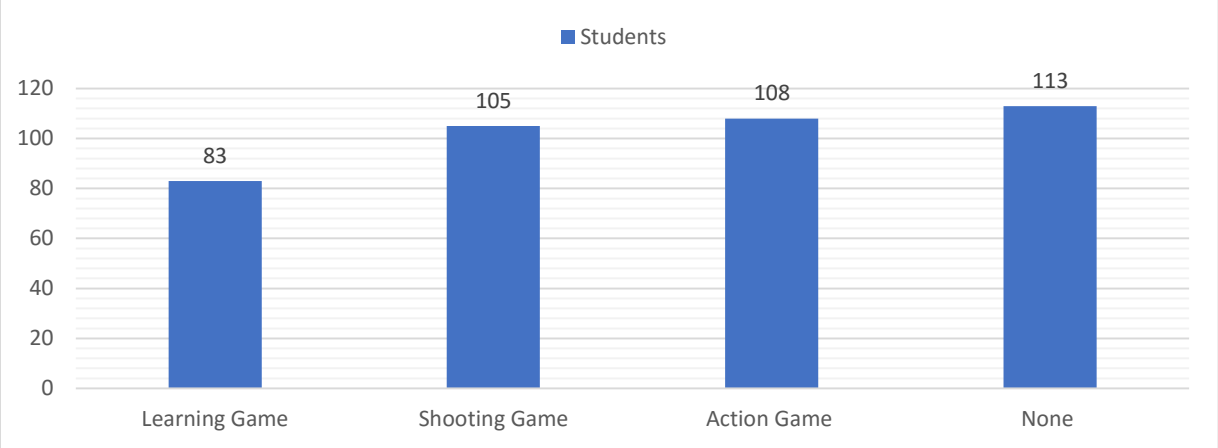


Within a group of students, there exists a range of preferences regarding how they access Code Fun in the absence of a smartphone. Based on the data collected, it can be observed that the most widely preferred approach, selected

by a significant majority of 260 students, is to employ a desktop computer equipped with an emulator. An additional 27 students would choose to utilize a mobile device belonging to a peer for this particular objective. It is worth noting that a total of 113 students have exhibited a distinct inclination towards none of the provided options. This observation suggests the presence of a substantial cohort that may possess alternative preferences or potential solutions. The findings indicate that just a small percentage, specifically 9 individuals, within the sample population expressed a willingness to acquire a novel mobile device to access Code Fun. Consequently, this particular option emerged as the least favored among the cohort. The observed preferences indicate the varied strategies employed by students when attempting to access Code Fun in the absence of a smartphone, with a notable inclination towards utilizing desktop emulators.

Q7: Please think of the game(s) you currently play the most and select them below.

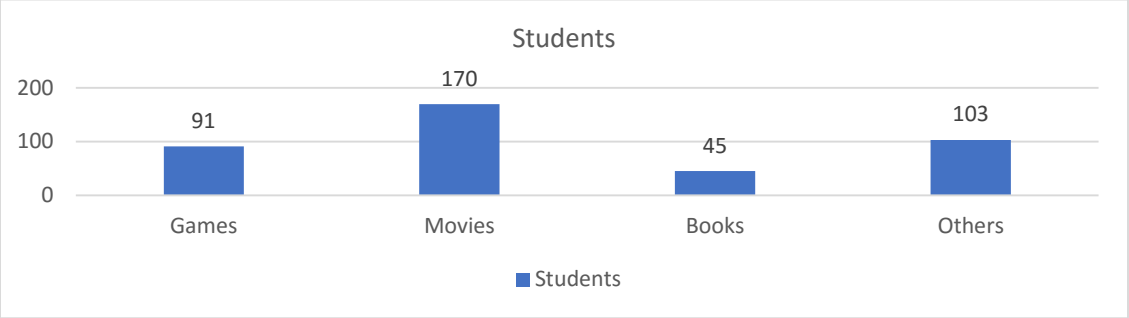
Figure 13



Among this cohort of students, a wide range of gaming preferences is evident, underscoring the remarkable diversity of interests within the group. The predominant cohort, consisting of 113 individuals, has chosen the option labeled as "None," signifying their lack of a distinct inclination towards any of the aforementioned genres of games. Among the cohort of individuals who possess discernible preferences, it has been observed that a total of 108 students exhibit a tendency towards engaging in action games. These particular types of games are characterized by their propensity for high-intensity gameplay and the presence of various challenges that necessitate skillful navigation and strategic decision-making. Nearby, it is noteworthy that a total of 105 students exhibit a preference for engaging in shooting games. This inclination suggests a predilection towards interactive digital entertainment that encompasses dynamic and tactical components. In the realm of education, it is noteworthy to observe that a total of 83 students have demonstrated a proclivity towards engaging in learning games. This inclination towards gaming signifies a keen interest among these individuals in the amalgamation of entertainment and educational elements within the gaming experience. The diverse preferences observed in this study highlight the extensive spectrum of gaming experiences and interests exhibited by the student participants.

Q8: By which method do you learn more?

Figure 14

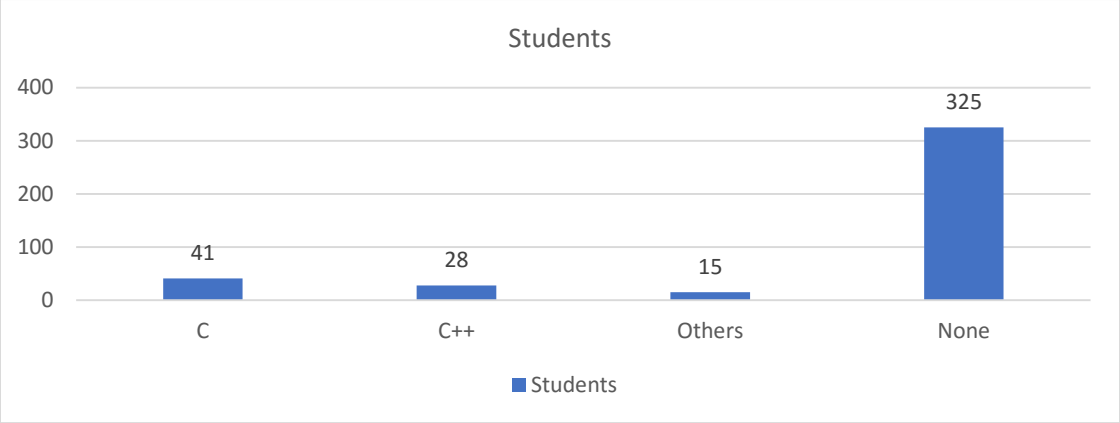


Among the group of students under research, a notable spectrum of learning preferences is discernible, thereby highlighting the multifariousness of their methodologies for assimilating information. Within the range of choices presented, it is evident that the predominant approach to acquiring knowledge is through the medium of movies. A substantial number of 170 students have indicated a clear inclination towards this particular mode of learning, which harnesses the power of visuals and the cinematic experience to facilitate educational endeavors. A notable observation is that a significant number of 91 students have demonstrated a preference for engaging in educational activities that incorporate game elements. This finding suggests a noteworthy level of enthusiasm and interest among these individuals for interactive and gamified learning experiences. In the realm of traditional learning, it is noteworthy that a total of 45 students exhibit a proclivity towards books, thereby placing a significant emphasis on written and textual resources as their principal means of acquiring knowledge.

Remarkably, a notable cohort of students, precisely 103 in total, have opted for the category labeled as "Others." This selection suggests that these individuals may possess alternative or distinctive approaches to learning that transcend the conventional categories provided. The presence of diverse preferences among students highlights the significance of providing a range of learning opportunities that can accommodate their individualized needs and interests. It is crucial to acknowledge that there is no universally applicable approach to education within this particular cohort.

Q9: In which language you have some knowledge

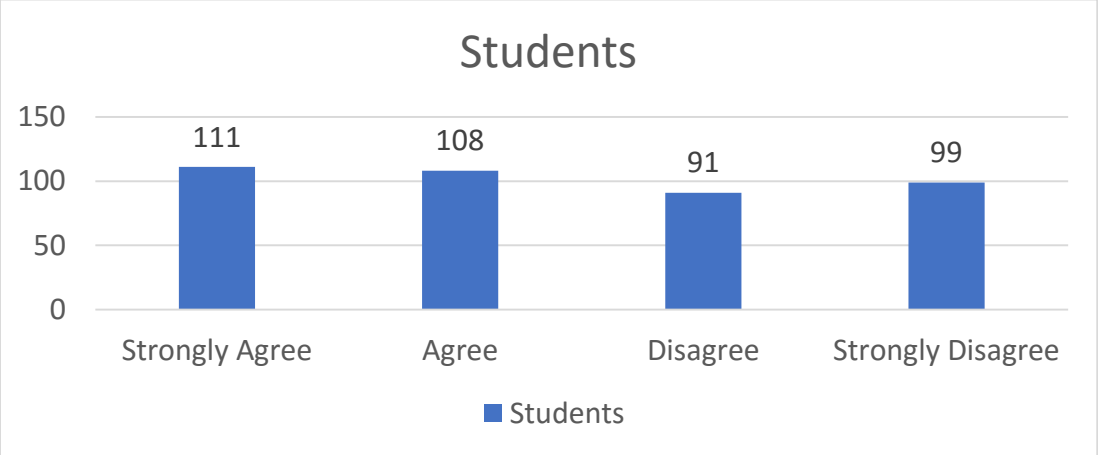
Figure 15



The findings of the analysis indicate that a significant proportion of students possess limited or no understanding of programming concepts.

Q10: Game-based Learning method is better than the traditional way of learning

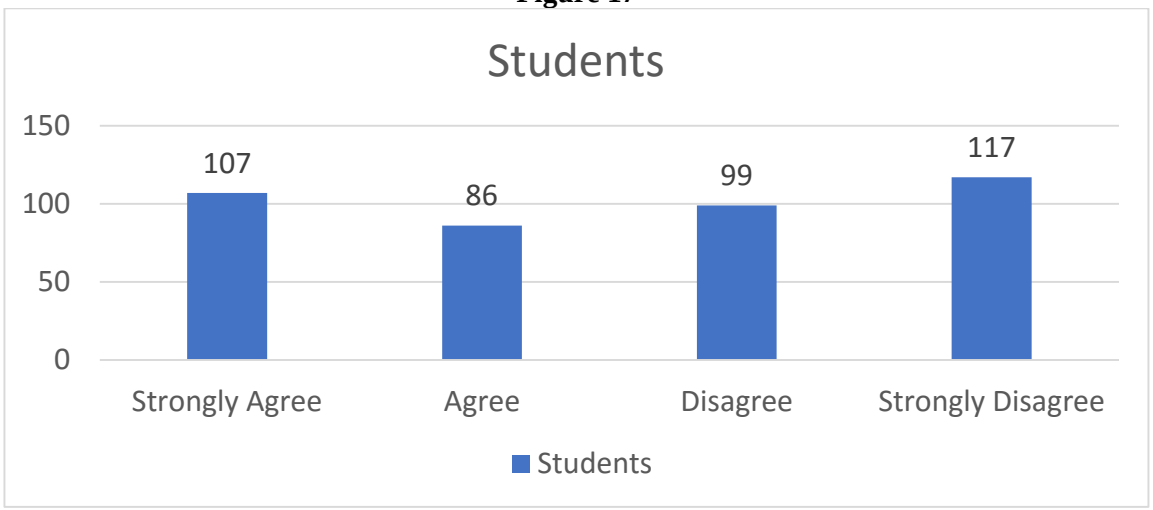
Figure 16



Within the aforementioned group of students, a notable variance in perspectives can be observed concerning the effectiveness of game-based learning in comparison to conventional learning approaches. A notable preference for interactive and gamified educational experiences is evident among the surveyed students. Specifically, 111 students strongly agree, while an additional 108 students express agreement, that game-based learning surpasses traditional approaches. This collective sentiment highlights the perceived superiority of game-based learning as an effective educational method. Nevertheless, it is imperative to duly recognize the subset of 99 students who hold a strong dissenting viewpoint, as well as the additional 91 students who express a more moderate level of disagreement regarding the proposition asserting the superiority of game-based learning. The students' viewpoints regarding the efficacy of these methods may vary, potentially leading to reservations or differing perspectives. The diverse array of viewpoints presented here serves to emphasize the significance of acknowledging the highly personalized nature of educational preferences. The phenomenon of game-based learning has garnered considerable interest among a substantial portion of the student population. However, a notable proportion of students continue to prioritize conventional learning approaches. The efficacy of these methodologies may ultimately be contingent upon a multitude of factors, encompassing the specific domain of study, pedagogical approach, and idiosyncratic cognitive preferences of learners.

Q11: Code Fun makes programming easy to learn.

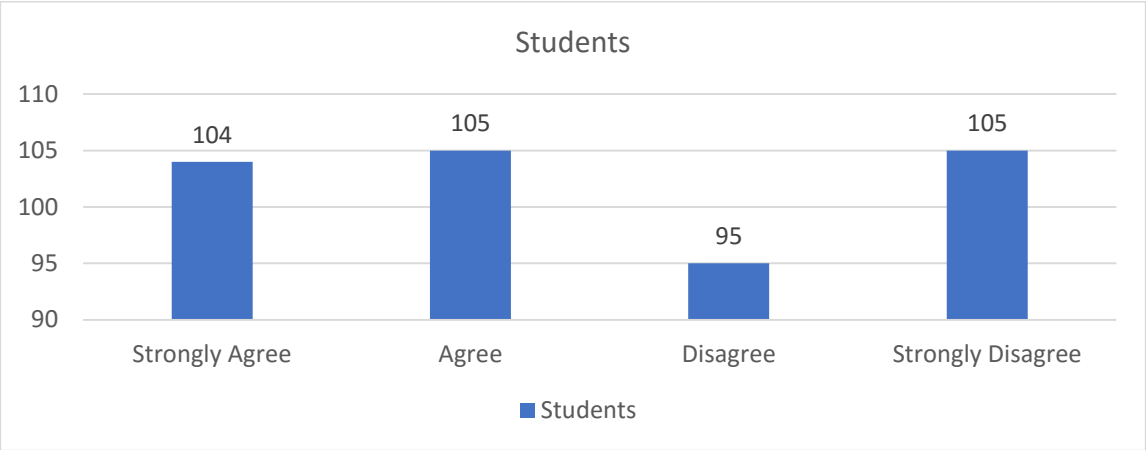
Figure 17



The results of the study indicate that within the sample of students, a significant majority of 117 individuals expressed a strong agreement with the statement that Code Fun facilitates the process of learning programming.

Q12: Would you like to play Code Fun again and again after learning?

Figure 18



Amongst this cohort of students, there exists a notable heterogeneity of perspectives about their inclination to partake in iterative gameplay with Code Fun after the educational experience. The data exhibits a uniform distribution of responses across the various categories, indicating a well-balanced representation of perspectives within the spectrum. A significant subset of the student population, consisting of precisely 104 individuals, exhibits a strong inclination towards endorsing the notion of engaging in repeated sessions of Code Fun after their initial exposure. This observation serves as a noteworthy indicator of the game's commendable capacity to sustain interest and enthusiasm among its users. In contrast, an equivalent cohort of students, comprising 105 individuals, express concurrence with this notion, thereby indicating a noteworthy inclination towards reexamining and fortifying their educational experiences via the medium of gameplay. However, it is of equal importance to acknowledge the group of 105 students who express strong disagreement with the notion of engaging in repetitive sessions of Code Fun following the learning process, as well as the additional 95 students who hold a more moderate level of disagreement. The potential exists for students to possess reservations or divergent preferences regarding their engagement with the game following the learning experience.

The diverse range of responses underscores the significance of acknowledging the inherent variability in students' approaches to reinforcing their learning after the initial educational experience. The subjective nature of individuals' experiences with repeated gameplay has been observed, with varying perspectives on its benefits and enjoyment. It is worth noting that certain individuals may have different preferences for alternative methods or may not perceive the inherent value of engaging in repeated gameplay. To effectively address the diverse preferences of learners, it is imperative to ensure that educational games, such as Code Fun, possess adaptability as a key feature.

Figure 19

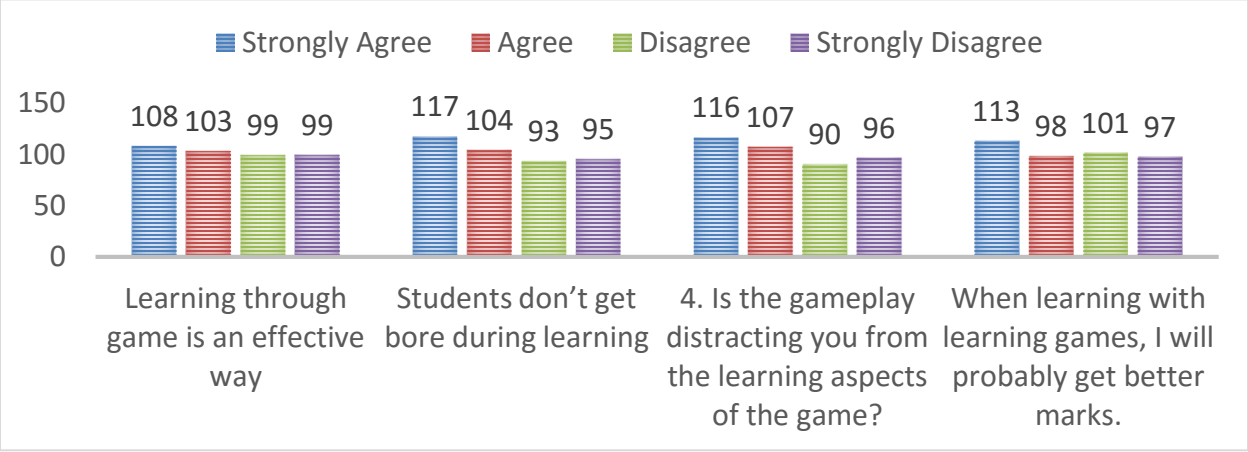
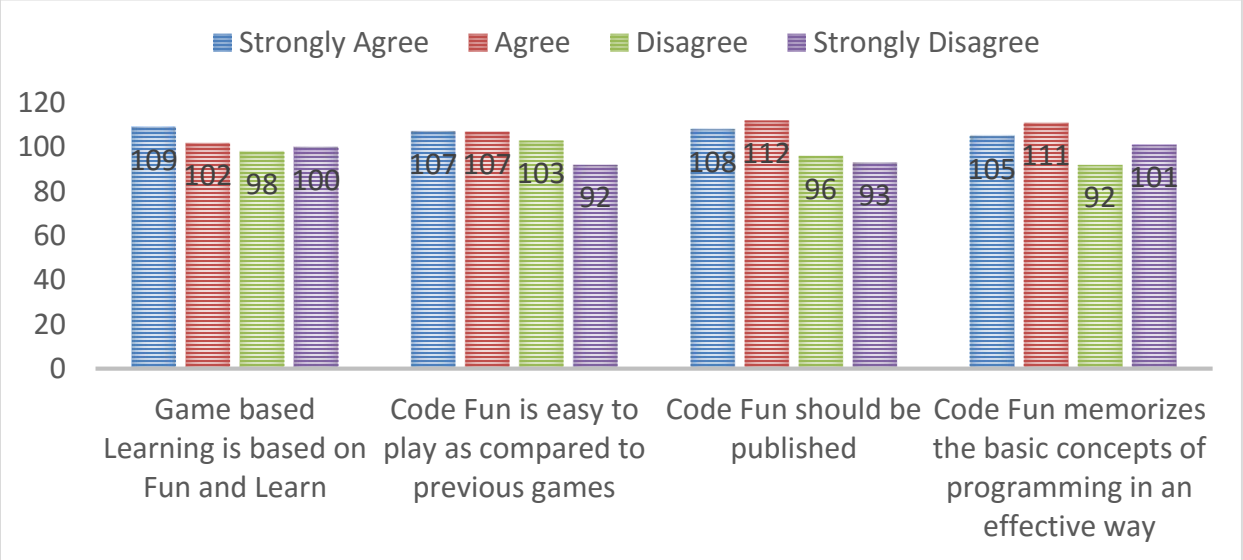


Figure 20



The aforementioned findings illustrate the collected responses to various inquiries posed to the student participants.

4.2 Discussions

The findings derived from the survey administered among student participants, about their perspectives on game-based learning in comparison to conventional learning approaches, provide significant contributions to our understanding of the intricate terrain of educational preferences. The aforementioned findings provide valuable insights into the intricate and multifaceted nature of contemporary education. Upon conducting a meticulous analysis, several pivotal topics for discussion emerge.

First and foremost, it is apparent that a considerable proportion of students harbor a firm conviction regarding the efficacy of game-based learning. Based on the collective agreement of 211 students, comprising those who strongly agree and agree, it becomes evident that a substantial proportion of the student body acknowledges the merits of incorporating games in education, recognizing their potential for fostering engagement and delivering educational value. The evident enthusiasm expressed in the statement implies that the strategic development and seamless incorporation of gamified educational experiences have the potential to serve as highly effective instruments for facilitating learning. Nevertheless, it is important to highlight the presence of a significant disparity among the student population, as a total of 198 individuals have conveyed reservations or displayed outright skepticism regarding the effectiveness of game-based learning. The presence of a wide range of perspectives serves to highlight the significance of comprehending and effectively dealing with the apprehensions expressed by individuals. The inquiry arises as to which factors might potentially contribute to the existence of these divergent perspectives. The inquiry pertains to the identification of particular facets within game-based learning that necessitate enhancement or the determination of specific subject domains wherein its efficacy surpasses others. The exploration of these inquiries can assist educators in honing their methodology for incorporating games into the curriculum.

Moreover, the findings from the survey shed light on the significance of the engagement factor. According to the findings of our research study, a substantial proportion of students, specifically 221 individuals, hold the belief that games possess the capability to effectively alleviate boredom encountered during the process of learning. This observation is consistent with the notion that the incorporation of interactive and engaging content has the potential to augment the educational process by effectively sustaining students' interest and motivation. A total of 188 students have voiced their concerns regarding the potential distraction posed by games during the learning process. The aforementioned statement underscores the significance of developing educational games that effectively blend entertainment and educational elements, thereby prioritizing the attainment of learning goals.Finally, the discourse surrounding the correlation between educational gaming and scholastic achievement is indeed captivating. Among the surveyed participants, a group of 211 students expressed a positive outlook regarding the potential of learning games to enhance their academic performance. Conversely, an alternative cohort of 198 students exhibited a more skeptical stance toward this notion. The existence of divergent viewpoints indicates that the correlation between educational games and scholastic achievements may not be universally acknowledged by students. This statement

prompts a deeper investigation into the precise elements that influence the formation of these contrasting perspectives. the findings of this survey underscore the imperative of adopting a nuanced and well-balanced strategy when integrating game-based learning methodologies into educational practices. The recognition of value and engagement in this approach is acknowledged by a significant proportion of students. However, it is imperative to equally prioritize the addressing of concerns and reservations expressed by individuals who maintain a skeptical stance. The importance of incorporating flexibility and adaptability into teaching methods cannot be overstated, as it enables educators to effectively leverage the advantages of game-based learning while also effectively addressing any potential obstacles that may arise. Ongoing research, continuous dialogue, and robust feedback mechanisms are essential components in the process of refining and enhancing the efficacy of game-based educational tools, with the ultimate goal of better addressing the diverse needs and preferences of students.

5. Conclusion

In conclusion, the integration of educational games within classroom settings is advocated for due to its potential to facilitate the acquisition of Python programming language skills from a novel perspective. The aforementioned genre of games offers a comprehensive learning experience to students, encompassing individuals with varying cognitive processing speeds. By engaging in these games, students acquire essential cognitive abilities, notably strategy formulation and problem-solving, which are indispensable for their future endeavors as adults. The integration of technology into contemporary society has garnered significant popularity. Consequently, the inclusion of educational games within the classroom environment can potentially provide students with a distinct advantage. The acquisition of knowledge about the environment surrounding individuals can be facilitated through engagement in these games, thereby obviating the necessity for physical exploration beyond the confines of one's residence or educational institution. The aforementioned genres of games are not intended to supplant books or pedagogical techniques; rather, they offer an alternative modality for educational engagement and instructional delivery. The pedagogical approach of incorporating games into educational settings has been recognized as a potentially effective method for teaching students. When utilized appropriately, games have the potential to yield positive outcomes in the learning process. The potential omission of these games from students' educational experiences may result in limited exposure to the contemporary world, which is increasingly shaped by technological advancements. Consequently, it is imperative to impart appropriate knowledge and skills to students to equip them for the demands of the present era. According to Clay P. Bedford, the notion of utilizing educational games prompts contemplation. Bedford's quote emphasizes the potential of fostering curiosity in students as a means to facilitate lifelong learning. The quote suggests that while imparting a lesson to a student may have a temporary impact, instilling a sense of curiosity can engender a continuous and enduring learning process throughout their lifetime (Bedford. The retention of learning tools and instructional methods by students is a noteworthy aspect to consider. Educational games have emerged as a novel pedagogical approach, serving as a contemporary learning tool for students. These games effectively facilitate the acquisition of technological skills, thereby equipping students with the necessary competencies to navigate and thrive in our rapidly evolving world.

References

Mattheiss, E., Kickmeier-Rust, M., Steiner, C., & Albert, D. (2009). Motivation in game-based learning: It's more than 'flow'. In Proceedings of 3. Workshop Game-based Learning, DeLFI 2009.

Mayer, I. & Bekebreda, G. (2006). Serious games and simulation-based learning for infrastructure management. In M. Pivec (Ed.), Affective and attentional aspects of human-computer interaction: Emphasis on game-based and innovative learning approaches. Amsterdam: IOS Press BV.

McKenzie, J. (2007). Digital Nativism Digital Delusions and Digital Deprivation. *The Education Technology Journal*, 17(2).

Michael, D., & Chen, S. (2006). Serious games: games that educate, train, and inform. Boston, MA. Thomson Course Technology.

Mitchell, A. and Savill-Smith C. (2005). The use of computers and video games for learning. A review of the literature. London. Learning and Skills Development Agency.

Mitchell, A., & Savill-Smith, C. (2004). The use of computer and video games for learning: A review of the literature. London: Learning and Skills Development Agency.

Mitgutsch, K. (2007). Digital play-based learning; A philosophical-pedagogical perspective on learning anew. Paper presented at the Games in Action Conference, Gothenburg, Sweden.

Oblinger, D. (2004). The Next Generation of Educational Engagement, Journal of Interactive Media in Education, 8.

Oblinger, D. (2006). Games and learning. *Educause Quarterly Magazine*, 29(3), 5-7.

Oleggini, L., Nova, S. & Hurni, L.. (2009). Rendering Geographic Datasets with 3D Game Engine - Dealing with Compatibility Issues. In M. D. Kickmeier-Rust (Ed.), Proceedings of the 1st international open workshop on intelligent personalization and adaptation in digital educational games (pp. 27-33). October 14, 2009, Graz, Austria.

Oleggini, L., Nova, S., Hurni, L. (2009). 3D Gaming and Cartography - Design Considerations for Game- Game-based Generation of Virtual Terrain Environments. Proceedings of the 24th International Cartography Conference, Santiago, Chile, 15.-21.11.2009.

Orvieto, I; Kickmeier-Rust, M. D. (2010). "Hey Mom, I'm playing geography". Paper submitted to the Focus K3D conference on semantic 3D media and content. February 11-12, 2010, Sofia Antipolis, France.

Pannese, L., & Carlesi, M. (2007). Games and learning come together to maximize effectiveness: The challenge of bridging the gap. *British Journal of Educational Technology*, 38 (3), 438-454.

Pappa, D., Dunwell, I., Protopsaltis, A., Pannese, Hetzner, S., de Freitas, S. and Rebolledo-Mendez, G. (2010). Game-based learning for knowledge sharing and transfer: the e-VITA approach for intergenerational learning. In Felicia, Patrick (Ed), Handbook of Research on Improving Learning and Motivation through Educational Games: Multidisciplinary Approaches, Hershey: IGI Global.

Paul N. & Hansen K. A.(2006). Disaster at Harperville: the modding of Neverwinter Nights to teach journalism students the strategic steps in information gathering. In Proceedings of ED-MEDIA'06 (pp. 1954–1959), Orlando, FL.

Pearson, E., & Bailey, C. (2008) The Potential Of New Generation Games Consoles To Support Disabled Students In Education. In Proceedings of World Conference on Educational Multimedia, Hypermedia and Telecommunications 2008, Vienna, Austria, pp. 6199 – 6205.

Peirce N., Conlan O., Wade V. (2008). Adaptive Educational Games: Providing Non-invasive Personalised Learning Experiences. In: Digital Games and Intelligent Toys Based Education, 2008 Second IEEE International Conference on (2008), pp. 28-35.

Petridis, P., Dunwell, I., de Freitas, S. and Panzoli, D. ''An Engine Selection Framework for High Fidelity Serious Games''. The 2nd International Conference on Games and Virtual Worlds for Serious-Applications (VSgames'10). 25-26 March 2010. Braga, Portugal.

Pivec M (Ed.), (2006) Affective and emotional aspects of human-computer interaction; Game-Based and Innovative Learning Approaches. Vol.1: The Future of Learning (IOS Press, 2006).

Pivec M, (2005) Play and Learn: Potentials of Game-Based Learning. *Malaysian Journal of Educational Technology*, Volume 5, Number 1.

Pivec M., (2007) Play and Learn: Potentials of Game-based Learning. Guest Editorial, BJET, Vol. 38, Issue 3, May 2007.

Pivec M., Moretti M. (Eds.), (2008) Game-based Learning: Discover the pleasure of Learning. Pabst Vrlg.

Pivec M., Panko M. (2008) Instructional design – sex driven?. Chapter in Chen I., Kidd T. (Eds.): Social Information Technology: Connecting Society and Cultural Issues" (Idea Group Publishing, 2008).

Pivec M., Pivec P. (2009) IMAGINE report on Game-Based Learning projects within the European community and good practice case studies spread across all levels of education. July 2009, http://www.imaginegames.eu/eng/Reports

Pivec M., Pivec P.(2009) Chapter 7: What do we know from research about the use of games in education? http://games.eun.org/upload/gis-full_report_en.pdf

Pivec M., Trummer Ch., Pripfl J. (2006) Eye-Tracking Adaptable e-Learning and Content Authoring Support. Informatica (An Int. Journal of Computing and Informatics) 30 (2006) p. 83 – 86.

Pivec, M., & Kearney, P. (2007). Games for Learning and Learning from Games. Informatica 31 (2007) pp 419-423.

Pivec, M., Baumann, K.,(2004): The Role of Adaptation and Personalisation in Classroom-Based Learning and e-Learning. Special Issue of J.UCS "Human Issues in Implementing eLearning Technology", January 2004

Pivec, M., Dziabenko, O. (2004): Game-based learning framework for collaborative learning and student e-

teamwork". e-mentor 2/2004.
Pivec, M., Dziabenko, O.,(2004): Game-Based Learning in Universities and Lifelong Learning: "UniGame: Social Skills and Knowledge Training" game concept. Special Issue of J.UCS "Human Issues in Implementing eLearning Technology", January 2004.
Pivec, M., Koubek, A., Dondi, C. (Eds.) (2004). Guidelines for game-based learning. Rockledge: Dustri.
Pivec, P. & Pivec, M. (2009) Collaborative Online Roleplay for Adult Learners. Chapter in Zemliansky P. (Ed.): Design and Implementation of Educational Games: Theoretical and Practical Perspectives.
Pivec, P. & Pivec, M. (2009) Immersed d how? That is the question. In Human IT. *Journal for Information Technology Studies as a Human Science*, 10(1):80-104.
Prensky, M. (2001). Digital game-based learning. New York: McGraw-Hill.
Prensky, M. (2001). Digital Natives, Digital Immigrants. On the Horizon, 9:5, Sept-Oct 2001. Prensky, M. (2001). Do They Think Differently? On the Horizon, 9:6, Nov-Dec 2001.
Prensky, M. (2002). Not Only The Lonely: implications of "social" online activities for higher education. *On the Horizon*, Vol 10, No 4.
Prensky, M. (2002). Open Collaboration. *On the Horizon*, Vol 10, No 3.
Prensky, M. (2006). Don't bother me, Mom, I'm learning. St. Paul, MN. Paragon House.
Rabasca, L. (2000). The Internet and computer games reinforce the gender gap. *Monitor on Psychology*, 31(9).
Rebolledo-Mendez, G., Avramides, K., de Freitas, S. & Memarzia, K. (2009). Societal impact of a Serious Game on raising public awareness: the case of FloodSim, in Proceedings of the 2009 ACM SIGGRAPH Symposium on Video Games. New Orleans, Louisiana, pp. 15-22.
Rebolledo-Mendez, G., Burden, D. & de Freitas, S. (2008). A Model of Motivation for Virtual-Worlds Avatars. In H. Prendinger, J. Lester, and M. Ishizuka (Eds.): IVA 2008, LNAI 5208, pp. 535–536. Berlin, Heidelberg: Springer-Verlag.
Reese, D. (2007). First Steps and Beyond Serious Games as Preparation for Future Learning. *Journal of Educational Multimedia and Hypermedia* 16(3), 283-300.
Rice, J. (2007). New Media Resistance: Barriers to Implementation of Computer Video Games in the Classroom. *Journal of Multimedia and Hypermedia*, 16(3), 249 - 261.
Rosser, J. C., Lynch, P. J., Cuddihy, L., Gentile, D. A., Klonsky, J., & Merrell, R. (2007). The impact of video games on training surgeons in the 21st century. *Archives of Surgery*, 142(2), 181-186.
Roussou, ?., & Vlachou, E. (2008). The challenge of creating digital game-based learning environments for museums. In Proceedings of the International Toy Research Association's (ITRA's) World Congress 2008 "TOYS AND CULTURE", Nafplion, Greece.
Roussou, M. (2002). Narrative as an instrument for the construction of cultural and educational Virtual Reality experiences. *Imeros Journal for Culture and Technology* (2), pp. 13-28.
Roussou, M. (2004). Learning by Doing and Learning through Play: An Exploration of Interactivity in Virtual Environments for Children. *ACM Journal of Computers in Entertainment*, Volume 1, Issue 2: Educating Children Through Entertainment, ACM Press, New York, NY, USA.
Roussou, M. (2009). A VR Playground for Learning Abstract Mathematics Concepts. *IEEE Computer Graphics and Applications*, 29(1), 82-85.
Roussou, M., Johnson, A., Moher, T., Leigh, J., Vasilakis, C., & Barnes, C. (1999). Learning and building together in an immersive virtual world. *Presence*, 8(3), 247-263.
Roussou, M., Oliver, M., & Slater, M. (2006). The Virtual Playground: an Educational Virtual Reality Environment for Evaluating Interactivity and Conceptual Learning. *Journal of Virtual Reality* 10(3-4), Springer, pp. 227-240.
Roussou, M., Oliver, M., & Slater, M. (2007) Exploring Activity Theory as a Tool for Evaluating Interactivity and Learning in Virtual Environments for Children. *Journal of Cognition, Technology & Work*.
Ruben, B. D. (1999). Simulations, games, and experience-based learning: The quest for a new paradigm for teaching and learning. *Simulation & Gaming*, 30, 498-505.
Sandford, R. (2006). Teaching with Games. Paper presented at JISC Online Conference: Innovating with e-Learning 2006. 30th March. Available in Innovating e-Learning Practice - The proceedings of the JISC Online Conference: Innovating e-Learning 2006. Cheltenham. Direct Learn Services Ltd. Last retrieved online at: www.jisc.ac.uk/elp_conference06.html

Sandford, R. and Williamson, B. (2004). Racing Academy: Learning Research Report. Bristol: Nesta Futurelab.

Sandford, R., Ulicsak, M., Facer, K., & Rudd, T. (2006) Teaching with Games: Using commercial off the- shelf computer games in formal education. Bristol. Futurelab.

Shaffer, D. W. (2006). How video games help children learn. New York: Palgrave Macmillan.

Shaffer, D. W., & Squire, K. D. (2006). The Pasteurization of Education. In Education and Technology: Issues in Policy, Administration and Application. London: Elsevier.

Shaffer, D. W., Squire, K.D., Halverson, R., & Gee, J.P. (2005). Video games and the future of learning. *Phi Delta Kappan*, 87(2), 105-111.

Sharpe, R., Beetham, H. & de Freitas, S. (Eds) (2010), Rethinking learning in the Digital Age, London & New York: Routledge.

Siemens, J. (2007). Digital natives and immigrants: A concept beyond its best before date. Retrieved from http://connectivism.ca/blog/2007/10/digital_natives_and_immigrants.html

Simkins, D. & Steinkuehler, C. (2008). Critical ethical reasoning & and role play. *Games & Culture*, 3, (333-355).

Sims, B. (2001). The effect of an educational computer game on motivation to learn basic musical skills: a qualitative study, in Proceedings of the Fifth International Technological Directions in Music Learning Conference.

Singer, E. (2006). Brain Trainer: How to conquer cognitive decline, one game at a time. Technology Review (March/April).

Sorensen, B. & Meyer, B. (2007). Serious Games in language and learning – a theoretical perspective. Digital Games Research Association 2007 Conference: Situated Play, Tokyo, 559 – 566.

Sprague, D. (2004). Technology and Teacher Education: Are we talking to ourselves? *Contemporary Issues in Technology and Teacher Education*, 3 (4), 353-361.

Squire, K. & Jenkins, H. (2004). Harnessing the power of games in education. *Insight* (3)1, 5-33.

Squire, K. (2003). Video games in education. *International Journal of Intelligent Simulations and Gaming* (2) 1.

Squire, K. (2007). Games, learning, and society: Building a field. *Educational Technology*, 4(5), 5154. Squire, K. (2008). Open-ended video games: A model for developing learning for the interactive age. In

K. Salen (Ed.) The John D. and Catherine T. MacArthur Foundation series on digital media and learning. (167-198) Cambridge, MA: The MIT Press.

Squire, K. (in press). Video Games and education: Designing learning systems for an interactive age. To appear in Educational Technology.

Squire, K., & Durga, S. (in press). Productive gaming: The case for historiographic gameplay. To appear in R. Ferdig (Ed.) The handbook of educational gaming. Hershey, PA: Information Science Reference.

Squire, K., & Klopfer, E. (2007). Augmented reality simulations on handheld computers. *Journal of the Learning Sciences*, 16(3), 371 - 413.

Squire, K.D. (2002). Rethinking the role of games in education. Game Studies, 2(1).