# Video Games as Teaching and Learning Tool for Environmental and Space Design

Mine Okur [1*], Erdal Aygenc [1]

[1] Near East University, Nicosia, CYPRUS

**ABSTRACT**

Video games today have turned into an important commodity with the use of art, design, science-technology and marketing techniques together, and the target audience has constantly evolved their expectations from game producers with the goal of getting huge profits so this technology developed. One of the most important factors of this development is the environment and space design used in the game production process. "Assassin Creed Unity" is a game which is produced by using the technology in the environment and space design at a very good level. The 3-dimensional spaces used in the games, which have been modelled with great success, have recently been associated with real-world examples by directly copying the original spaces. While the player's perception of the environment and space during the game are both auditory and knowledge, which is a result of hand and eye coordination and this acquisition process is also facilitated with the guidance, instructions and directions provided by the game. The story, architectural and graphic elements used in the game made extremely important contributions to the success of the game. This significant impact has been confirmed with a survey conducted with on a number of people that is actively using video game.

**Keywords:** environment and space design, video games, Assassin Creed Unity, graphic design, interface design

## INTRODUCTION

Innovations and facilities that technology has added to our lives are at an undeniable level. Portable, wearable technologies, devices and products, social media applications like Facebook are in every aspect of our lives. Thus, technology-based education and training inevitably entered into our lives. Nowadays, Facebook is one the largest social media applications with over 2 billion users. It is used as a part of education in areas such as statistics and mathematics despite all the obstacles and difficulties (Manca, 2013; Şenyapılı, 1996).

However, as a part of technology education, videogames and similar applications emerged as a popular topic in education today. In studies, the facilities and applications of games for learning as well as the key role of design are beginning to be used effectively (Clark et al., 2016; Kalınkara, 2006).

Interactive environment using a game-based approach can help students have fun while learning as it can be used as a game-based approach. In some studies, it was observed that the students who had fun and learned at the same time performed considerable progress in their learning ability and the persistence of the learned information was found to be more successful than the traditional way of learning (Liu et al., 2014; Ke, 2016; Griffiths, 2002). It seems that videogames have great positive potential in addition to their entertainment value and there has been considerable success when games are designed to address a specific problem or to teach a certain skill (Griffiths, 2002; Brooker & Stone, 2011)

Game-like applications provide training and supportive experiences in different topics. For example, game-like applications and foreign language learning activity were found in the studies of Berns and others. According to the findings of the study, foreign language learning processes showed a positive correlation with graphic designs in video games (Berns et al., 2013; Roth, 2000).

✉ mine.okur@neu.edu.tr (*Correspondence) ✉ erdal.aygenc@neu.edu.tr

**Contribution of this paper to the literature**

- This study aims to contribute to a novel understanding of video games in education as it discusses the results of motivation for playing games with other studies. Study also contributes to form and change the limited understanding of the positive results of video games. The narrative language, created by combining the past, present or future environment and space design fiction with the basic rules of cinematography, has taken video games to another dimension today.



**Figure 1.** Project Ariana (Jenixe Wallpapers, 2007)

In the 21st century, traditional education and teaching processes in the public, private and businesses have begun to disappear, as this type schooling is not sufficient for today's conditions and expectations. Teaching processes have changed in a positive way by graphic designs in video games and so technological innovations have taken a more important role in teaching process (Miller, 2015).

Video games in which concept, character, environment, space, interface designs and computer engineering have realized into a dynamic medium, art, design, science, and marketing techniques used together transformed into a meta. Game producers prefer to use both technology and art and design as a privilege in order to be able to market their products easily and to make great profits. Therefore, design - especially environment and space design - can be the most important distinguishing feature that determines the success of a game in the production process of a game (Huizinga, 2016). The narrative language, created by combining the past, present or future environment and space design fiction with the basic rules of cinematography, has taken video games to another dimension today. The use of cinematography in games has put the design of space and environment foreground by making it the most powerful artistic element that brings out the narrative, story and game fiction to the fore and integrates the player with the game (Green & Kaufman, 2015).

Thanks to the technological development that is reflected in the gaming industry, spaces which are present or not in the real world and are difficult to create, are built by means of 3D software and very high resolutions which is very close to the real world are obtained with images supported by 3D game engines (Bowman et al., 2012; Stevenson, 2003). For this reason, technological developments are regarded as the most important scientific element in the rapidly growing success of the gaming industry. With the influence of science and art in video games, both game producers and game consumers are becoming greedier, leading to the discovery of new technologies. The world's first video projection system designed for video gaming is Project Ariana. With the ultra-wide fish eye lenses and advanced processing features, we can give a video projector that extends as big as room as an example (**Figure 1**).

## ENVIRONMENT AND SPACE DESIGN IN VIDEO GAMES

During the game we use multiple sensory organs to locate the items in our environment. This point differs from the perception of the physical structures that exist in the real world and the perception of things in the game. Our senses support only our vision, hearing, and sometimes touching (sensing with vibration on joysticks). According to Arnheim, forms, colours, movements and voices are open to a specific and highly complex organization in terms

**Figure 2.** A scene from the game of DESTINY (The Wonders of the World, 2017)



**Figure 3.** The scene in ACU in which the character assault an enemy (Tech 4 Gamers, 2017)

of space and time when the sense of sight and hearing is concerned. Therefore, these two senses, namely, vision and hearing, are the perfect environment for using intelligence (Arnheim, 1997; Nitsche, 2009).

The combination of architectural forms, textures, materials, light and shadow balance, colour in the space and environment designs come together to make people feel the feature or the spirit of the space (Smuts, 2005). These are the atmospheric features that have a place in mind. The atmosphere, which means "the environment in which you live and you get affected" (http://www.tdk.gov.tr), is the most important element that creates the period, the style and the desired feelings in terms of being associated with the story. For example, if a future emulation game is edited as in "DESTINY", the atmosphere has to support the future lifestyle, events and feelings that should be given in the story. This is an unchanging rule from the most complex game to the simplest game (**Figure 2**).

Assassin's Creed Unity (ACU) and Third Person Shooter (TPS) games are highly successful examples of empowering the story with time and space. The TPS game type has a structure that is monitored by controlling the behaviour of the selected character in the game by watching from outside the camera with different camera angles. Looking at the character from the outside leads the player to follow the character. The camera usually looks behind the character. This makes it easier for the player to interact with all of the factors in the surroundings in the game, seeing the commands he gives to the character. For example, in ACU, a strategy for how to intervene and rescue a character from attackers, or the ability to perceive the escape points and make the right decisions can be shown as an example (**Figure 3**) (Saga, 2015).

The wandering around, movement and limitations of the character in the game are directly related to the design of indoor and outdoor spaces. For example, a narrow corridor or walking path makes it difficult for the player to move. The player cannot stand and wait in that area. Yet, a more comfortable and larger space gives players the opportunity to think, stand or look around. According to Ching, the movement route is considered as a perceptual link that connects architectural spaces or interior and exterior spaces. Since we move along the consecutive sequence of places in time, we get experiences related to a place, where we are, or where we are going (Ching, 2002; Walz, 2010).

There are other helpful factors that allow players to experience the space. These are some of the most important elements in Graphic Design that we use in our daily lives, such as warning and direction signs and symbols. Thanks to these, the player is able to perform his actions.

**Figure 4.** Associating the spaces designed with the real spaces that exist today (Donanım Haber, 2017)

It is seen that the decisions made during the game are directly related to the information obtained as a result of the perception of the space and the environment. If there is no way to walk in the game surrounding and this can only be realized through perception, the information about how to get to the point can be reached by jumping the obstacles (buildings, people, trees, etc.). Sometimes this can be given as a help to the player or the player can be visually assisted with the Graphic Design so it can be perceived. If new events are encountered during the game, decisions can change accordingly. Thus, new actions can be done by reaching new information. These options are often used in all recent games.

When the 3-dimensional designed spaces in the ACU are associated with today's examples, they are modelled with great success by imitating the original spaces (**Figure 4**). It is possible to say that the success of modelling spaces directly and positively influences the success and popularity of game quality.

# METHODOLOGY

The basic purpose of the study was to measure whether the story, architectural and graphic elements used in the games have a profound effect on the game players and how much the game contributed to the success of the mission. The presence of such an important influence has been assessed with a survey of 200 people using video games actively. The survey was conducted via Internet using various platforms and participants shared their ideas about space, story, graphic design, etc. used in the games. The gender, age and education of the respondents were given in **Table 1**.

**Table 1.** Survey participants' profiles

| Participants | | % percentage | |
|---|---|---|---|
| **Gender** | Women | 8.5 | |
| | Men | 91.5 | |
| **Age** | 20 and under age | 62.5 | |
| | 21-25 | 14 | |
| | 26-30 | 11 | |
| | 31-35 | 5.5 | |
| | 36-40 | 2.5 | |
| | Above 40 | 4.5 | |
| **Education** | Primary | 28 | |
| | Secondary | 32 | |
| | University | 28.5 | |
| | Post Graduate | 11.5 | |
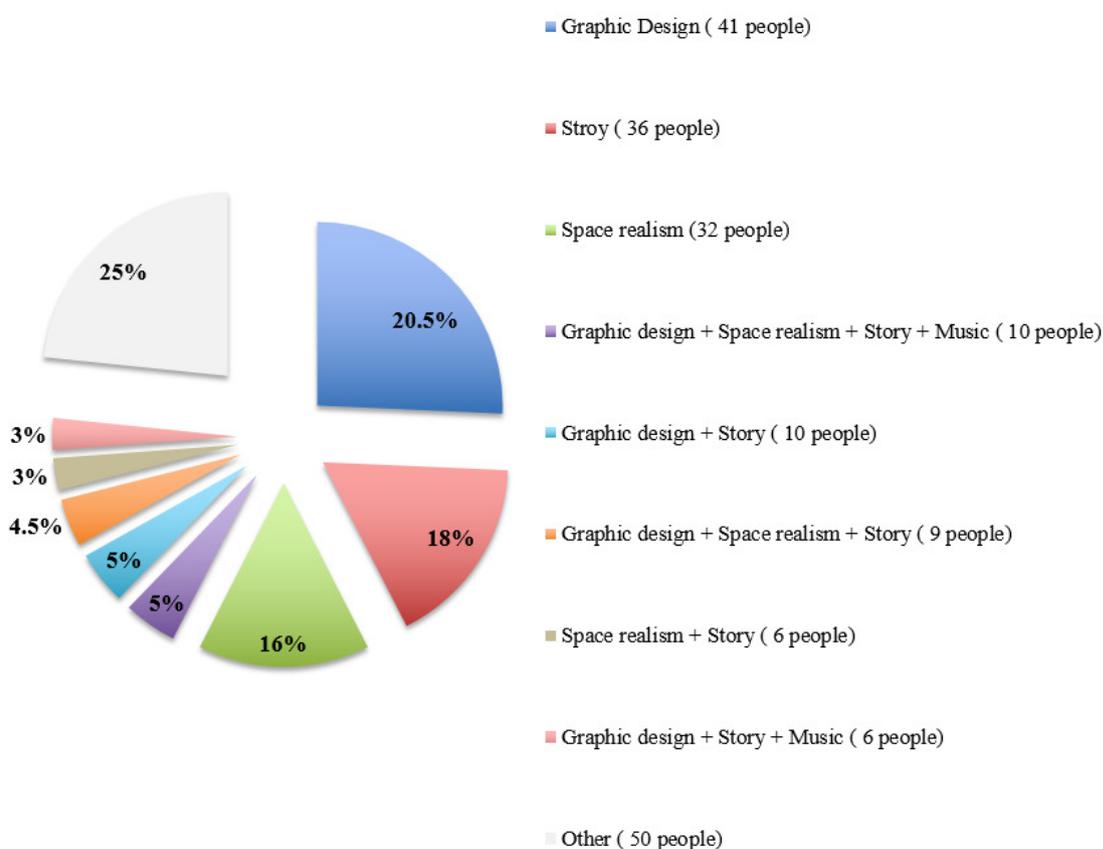


**Figure 5.** Important components preferred by players

## RESULTS

According to the data obtained from the questionnaire, we can see that more men are interested in computer games, the most interested age group is under 20 years, and the number of people who play computer games show a reversed correlation with the education level.

Those who participated in the survey ranked the most important components they prefer in the games they play and this was shown in **Figure 5**. According to this, graphic design is the most important (20.5%), which contributes to the successful blending of storytelling, story (18%) and reality of spaces (16%) followed it respectively. Some participants noted that these components are equally important, not one by one (graphic design + space realism + story). Music is considered as a contributing factor to these components. The "other" group (25%) mentioned factors such as fun, playing style, online mode and thought provoking factors, which were evaluated differently by each participant.

## DISCUSSION AND CONCLUSION

It is known that video games help especially children to build basic development skills such as visual patterns, speed and game story. It is known that game players learn and practice basic mathematical skills, reading skills and social skills, and that these skills progress even further as they play. According to Demarest, the language skills gained by video games are discussed and shared, followed by directives (understanding prepositions, etc.), giving directions, answering questions and making a discussion with visual aids to share with others (Gauthier et al., 2015). On the other hand, it is argued that game-based approaches can be effective on learning in all areas, messages that are deepened with graphic designs in school life can be given with a fun and interesting approach (Boyle et al, 2014).

Another study shows that video games play an important role in the development of basic mathematical skills because children learn to interact with the counter on the video. In the same study, the basic reading skills of the learners are shown on the screen ('Play', 'Exit', 'Go', 'Stop', Upload etc.). Besides these, video games develop social skills, as it makes a lot easier to talk and play together by creating a popular common interest with other children. There has always been and will be children who have a passion for playing video games in and out of school Griffiths (2002).

According to the findings of Gauthier et al., the integration of game design provides significant contributions to the context of educational tools and information assessment (Gauthier et al., 2015). These contributions are to the competence in the language, to the areas that require foreign language and in areas that require analytical thinking such as mathematics, and it also plays an effective role on users' social skills and communication skills (The Wonders of the World, 2017). With the expansion and persistence of these important contributions, entertainment should be included in the process in order to live and improve their emotional states and keep them at the top level (Gonzales et al., 2014).

Ruano et al.' s study was based on observations of student activities and learning processes for a long period of time for about 2 years. Ruano and others suggest that the design of video games can be a very effective activity. To demonstrate this, they used the design of the game with a group of subjects attended from Computer Sciences and History. So, for the first time, perhaps for the first time, the interdisciplinary teams collaborated in designing a video game (Fjællingsdal & Klöckner, 2017).

The experiment was repeated for over three academic years. The motivation of the students was evaluated in the last 2 years and the results indicated that the academic success of the students is higher when using the interdisciplinary design of video games as a way of learning instead of traditional learning methods (Ruano et al, 2014).

Besides their significance of teaching and learning, art, design, science and technology are used together with dynamic structures that turn into important products as video/computer games. It should be noted that environment and space designs are one of the important features determining the success of a game. In order to provide these features, it is important to make a contribution to the success of the game, especially when the team working for visual design has been trained in art and design, and has experience and culture with a certain aesthetic understanding, it is more possible and professional. It is important that basic design elements and principles such as colour, toning, foreground and background relation and reflection of formal relations are used in game design together with cinematographic and aesthetic expressions and this can be done better by professionals. A well-designed environment and space help players to perceive easily with his visual and auditory sense organs. As an example, Assassin's Creed Unity game in which the environment and space were realized identically like its real model and at the same time strengthened with story and fiction, can be seen as one of the important factors in the success of the game (The Verge, 2017). In the survey conducted with the people playing video games show that graphic design, story and the reality of the places used are important parameters.

In the study of Arnab and others the main focus was to discuss the description of the designers of serious games, which provide a more systematic aspect of the link between pedagogical principles and game elements. According to the findings of the study SG design has been linked with entertainment game design, particularly in the context of adopted game mechanics. In particular, the study revealed particular strengths of some games that are typical of entertainment games and are also suited for serious and educational games. (Arnab et al., 2015)

Videogame technology brings new challenges to the field of education. Video games are a technique that a classroom teacher can use. However, care must be taken that the use of enthusiastic in this technique does not replace other more effective techniques. Video and computer based games may have advantages not found in other learning strategies. For example, finding different solutions to a difficult problem and seeing those decisions in an imaginary cast will ensure that students have a problem-solving ability in a relatively safe environment (Flood et al., 2015).

Video games, besides being fun with the design by professionals, have a very positive potential. Significant success has been achieved when games are specially designed to produce solutions to a specific problem or to teach

a particular skill. Nonetheless, the generalizability beyond video game playing remains an important research question. Empirical studies in the literature suggest that the adverse consequences of playing games almost always involve people who are overly videogame users (Siegal, 2014).

There is little evidence from pioneering work in this area that moderate games have serious acute adverse effects on health, the adverse effects are relatively insignificant and temporary, presumably effects that are self-resolved, or affect only a small subset of players, with reduced game frequency. The extreme player is the ones most at risk of developing health problems. However, more research is needed in order to have more reliable results (Griffiths, 2002; Tech 4 Gamers, 2017).

## RECOMMENDATIONS

Assassin's Creed Unity (ACU) and Third Person Shooter (TPS), Minecraft and similar games are thought to be user-friendly in classroom educational activities and to provide information flow through visual learning. For this reason, a video game can be used very easily in art curricula and for graphic design lessons (Overby & Jones, 2015). Therefore, we believe that the effects of the teaching process of the subject game and other similar games should be evaluated when the basic skills in learning with mathematics are given to the students. Scientists and Educational Technologists have great responsibilities in order to realize this.

"The CHERMUG quantitative and qualitative games (www.chermug.eu) are digital games designed to support students as they learn about research methods and statistics" (Boyle et al., 2014). It is believed that Chimug-like graphic design messaging videogames should be enabled and disseminated. Thus, it can be possible for teachers and lecturers to use them in their class. For this, scientists who are active in technology education have great responsibilities too.

Researchers argue that teachers and parents should make an effort to increase their awareness of the potential positive educational benefits of playing video games. What factors hamper teachers' use of computer and video games in the school should be researched and possible solutions should be proposed. The reasons preventing the purchase of computers and video games should also be researched. In service training should be available to increase the awareness that how video games meet teachers' present goals and their place in learning and teaching knowledge. On the other hand, relatively few researches in the field of game-based learning included teachers (Ketelhut & Schifter, 2011. Even this number is increasing which shows that game based learning has an increasing momentum and has a great place in education, more researches should be done including teachers and lecturers.

For many, researchers and policy makers lack in policy-making according to the potential of educational games. In addition, the practical skills of selecting and implementing video games in the classroom environment need to be improved. Research-based awareness in the articles of Turkay et al., and the discussion of the factors that would facilitate understanding of selecting and using video games have started to fulfil the needs in this field. Some basic design elements in an educational video game are discussed in the same article, it was concluded that educational games can be conceptualized from different theoretical perspectives on learning (Turkay et al 2014). Video games for education should be designed in the light of these discussions and continuous renewal should be provided. Also, educators should make policy decisions according to the literature review results and contribute to the findings of current studies so that development can be ensured.

## REFERENCES

Arnheim, R. (1997). *Art and Visual Perception*. U.S.A.: University of California Press.

Arnab, S., Lim, T., Carvalho, M. B., Bellotti, F., Freitas, S., Louchart, S., ... & De Gloria, A. (2015). Mapping learning and game mechanics for serious games analysis. *British Journal of Educational Technology, 46*(2), 391-411.

Berns, A., Gonzalez-Pardo, A., & Camacho, D. (2013). Game-like language learning in 3-D virtual environments. *Computers & Education, 60*(1), 210-220.

Bowman, B., Elmqvist, N., & Jankun-Kelly, T. J. (2012). Toward visualization for games: Theory, design space, and patterns. *IEEE Transactions on Visualization and Computer Graphics, 18*(11), 1956–1968. doi:10.1109/TVCG.2012.77

Boyle, E. A., MacArthur, E. W., Connolly, T. M., Hainey, T., Manea, M., Kärki, A., & Van Rosmalen, P. (2014). A narrative literature review of games, animations and simulations to teach research methods and statistics. *Computers & Education, 74*, 1-14.

Brooker, G., & Stone, S. (2011). *İç Mekan Tasarımı Nedir?* (Z. Y. Halu, Trans.). İstanbul: Yem Yayınları.

Ching, D. K. F. (2002). *Mimarlık: Biçim, Mekan ve Düzen* (S. Lökçe, Trans.). İstanbul: Yapı-Endüstri Merkezi Yayınları.

Clark, D. B., Tanner-Smith, E. E., & Killingsworth, S. S. (2016). Digital games, design, and learning: A systematic review and meta-analysis. *Review of educational research, 86*(1), 79-122.

Donanım Haber. (2017). Retrieved on 03.08.2017 from https://store.donanimhaber.com/f3/86/d4/f386d4f199639dccdf429dea9372fe0f.jpg

Fjællingsdal, K. S., & Klöckner, C. A. (2017). ENED-GEM: A Conceptual Framework Model for Psychological Enjoyment Factors and Learning Mechanisms in Educational Games about the Environment. *Frontiers in psychology, 8*, 1085.

Flood, J., Heath, S. B., & Lapp, D. (2015). *Handbook of research on teaching literacy through the communicative and visual arts, volume II: A project of the International Reading Association*. London: Routledge.

Gauthier, A., Corrin, M., & Jenkinson, J. (2015). Exploring the influence of game design on learning and voluntary use in an online vascular anatomy study aid. *Computers and Education, 87*, 24-34.

González-González, C., Toledo-Delgado, P., Collazos-Ordoñez, C., & González Sánchez, J. L. (2014). Design and analysis of collaborative interactions in social educational videogames. *Computers in Human Behavior, 31*, 602-611.

Green, G. P., & Kaufman, J. C. (2015). Video Games and Creativity. *Video Games and Creativity*. doi:10.1016/C2014-0-00065-2

Griffiths, M. D. (2002). The educational benefits of videogames. *Education and health, 20*(3), 47-51.

Huizinga, J. (2016). *Homo Ludens: A Study of the Play-Element in Culture*. New York: Angelico Press.

Jenixe Wallpapers. (2007). Retrieved on 03.08.2017) http://jenixe.com/wp-content/uploads/2015/11/725016_assassins_creed_unity.jpg

Kalınkara, V. (2006). *Tasarım ve Dekorasyon*. Ankara: Gazi Kitapevi.

Ke, F. (2016). Designing and integrating purposeful learning in game play: A systematic review. *Educational Technology Research and Development, 64*(2), 219-244.

Liu, M., Rosenblum, J. A., Horton, L., & Kang, J. (2014). Designing science learning with game-based approaches. *Computers in the Schools, 31*(1-2), 84-102.

Manca, S., & Ranieri, M. (2013). Is it a tool suitable for learning? A critical review of the literature on Facebook as a technology-enhanced learning environment. *Journal of Computer Assisted Learning, 29*(6), 487-504.

Miller, S. M. (2015). Teacher learning for new times: Repurposing new multimodal literacies and digital-video composing for schools. *Handbook of research on teaching literacy through the communicative and visual arts, 2*, 441-453.

Nitsche, M. (2009). Video Game Spaces: Image, Play, and Structure in 3D Worlds. *International Journal of Gaming and Computer-Mediated Simulations, 1*(4), 90–93. doi:10.4018/jgcms.2009091505

Overby, A., & Jones, B. L. (2015). Virtual LEGOs: Incorporating Minecraft into the art education curriculum. *Art Education, 68*(1), 21-27.

Roth, M. L. (2000). *Mimarlığın Öyküsü*. İstanbul: Kabalcı Yayınevi.

Ruano, P., Sevilla, C., Santini, S., Haya, P. A., Rodríguez, P., & Sacha, G. M. (2014). Designing videogames to improve students' motivation. *Computers in Human Behavior, 31*, 571-579.

Saga, M. (2015). *What It's Like to Be an Architectural Consultant for Assassin's Creed II*. Retrieved on 03.08.2017 from http://www.archdaily.com/774210/maria-elisa-navarro-the-architectural-consultant-for-assassins-creed-ii/

Şenyapılı, Ö. (1996). *Görsel Sanatlar ve İletişim*. Ankara: Sanat Yapım Yayıncılık

Siegal, J. (2014). *Brilliant photos show how modern-day Paris compares to Paris in Assassin's Creed Unity*. Retrieved on 03.08.2017 from http://bgr.com/2014/12/02/assassins-creed-unity-paris/

Smuts, A. (2005). Are Video Games Art? *Contemporary Aesthetics, 3*, 1–16. Retrieved from http://www.contempaesthetics.org/newvolume/pages/article.php?articleID=299

Stevenson, A. (Eds.) (2003). *Oxford Dictionary of English* (2nd Ed.). Oxford: Oxford University Press.

Tech 4 Gamers. (2017). Retrieved on 03.08.2017 from https://tech4gamers.com/wp-content/uploads/2014/10/assassins-creed-unity-2014106173329_16.jpg

The Verge. (2017). Retrieved on 03.08.2017 from http://www.theverge.com/2014/10/31/7132587/assassins-creed-unity-paris

The Wonders of the World. (2017). Retrieved on 03.08.2017 from http://www.thewondersoftheworld.net/images/versailles1.jpg

Turkay, S., Hoffman, D., Kinzer, C. K., Chantes, P., & Vicari, C. (2014). Toward understanding the potential of games for learning: Learning theory, game design characteristics, and situating video games in classrooms. *Computers in the Schools, 31*(1-2), 2-22.

Walz, S. P. (2010). Toward a Ludic Architecture: The Space of Play and Games. Technology. Pittsburg: ETC Press.

# http://www.ejmste.com