FORUM

REBUILDING AN EMPIRE WITH MINECRAFT: BRINGING THE CLASSICS INTO THE DIGITAL SPACE*

Abstract: This article presents an innovative manner to supplement history and foreign language classes with a 3D modeling of ancient Rome by the widely played video game Minecraft. Assuming the persona of an ancient architect, students select a building, research it in primary and secondary sources and recreate it in its original Roman location. Here I discuss the benefits of using 3D software as a learning tool and the theory and methodology behind the implementation used with my Latin I–IV students, ages 13–18. I also analyze the data resulting from two iterations and offer further suggestions for implementation.

Winston-Salem/Forsyth County Schools' state curricula for high school Latin[1] require that history, mythology and culture be taught in addition to Latin. In 2011, while trying to visualize a Roman house I was researching for a Roman Daily Life class, I realized I had found a possible way to address the cultural element that would appeal to the high school students I was soon to acquire: Minecraft. Minecraft is a sandbox video game released in 2009 first for PC/MAC but now available on all major gaming platforms (Xbox, Playstation, etc.). It is currently played by over 54 million people worldwide.[2] This 3D game takes place in a randomly generated world and is experienced by the player's avatar from a first person perspective. The player must begin gathering materials which will be used to make tools to gather food and more materials to create improved tools. Once the player has obtained a sufficient amount and quality of supplies and tools, he or she may now venture out into the

* I first must thank CAMWS for awarding me with the B.I.G. Grant which made this whole project possible. Kind thanks I extend to Bartolo Natoli for being so encouraging and helpful during the composition and submission of this article, and to the anonymous referee for insight and suggestions. I am very grateful to Jonathan Zarecki and Matthew Nicholls for reading through a first draft and providing invaluable guidance and recommendations. Finally, to Laurel Fulkerson I owe a debt of gratitude for her astute and discerning attention to detail.

[1] The curricula for 2014–2015 Latin I-IV courses are available at http://www.wsfcs.k12.nc.us/Page/98253.

[2] Gueder (2014).

world to explore and, ultimately, build. When explaining Minecraft to others, I often liken it to Lego™ due to its constructive nature and even the style of materials with which one is to build. The building materials are all cube shaped, and the vast majority of these materials measure one meter squared.

This building need not be done alone, however. Players are able to set up servers to allow hundreds of fellow players to join and play in the same world simultaneously. While the multiplayer game can be played in Survival Mode whereby players must fend off starvation with food, monsters with weapons, and fellow players with intellect, or risk death, Creative Mode is best suited for the present application since this mode allows students to play without the fear of death, with an unlimited supply of building materials, and with several other advantages necessary for the purpose of re-creation.

What is also appealing about Minecraft is its customizability. Since the world in which one plays can be customized and the immediate space defined, the possibilities and applications are seemingly endless. Customization extends even to the textures of the blocks and the interface language. These two aspects, discussed later, I rely heavily upon to make my students' experience more immersive.

With the multitude of applications and possibilities this video game could offer to students, teachers who had been thinking of ways to incorporate this powerful tool into the classroom contacted the makers of Minecraft and together they created a classroom-ready version of the game called MinecraftEdu. In response to some of the limitations of standard Minecraft the makers of MinecraftEdu implemented "a set of powerful yet simple tools to fine-tune the Minecraft experience for learning."[3]

Benefits of the 3D Digital Space

As more educators turn to technology based tools like Minecraft[4] and other such 3D digital spaces, they are discovering the advantages of such learning environments. There are two major benefits which I will address here: digital convenience and immersive learning. Digital convenience refers to the ease of achieving some task which can best be afforded by the digital space in which the task is to be completed. For instance, some of the more experienced students can

[3] MinecraftEdu, available at https://minecraftedu.com/software.

[4] For some examples of the successful implementation of Minecraft, see Schifter (2013); Bukvic (2014); List (2014).

produce several high quality buildings in the span of a few class periods, suggesting that 3D spaces can provide faster and more engaging interactions with the material than comparable analog methods.[5] Students and teachers are able to work in a real-time environment, and to give and receive immediate feedback. This eliminates undue turnaround times for grading and the need for teachers to encroach upon students' personal space when providing assistance.[6] Digital convenience also permits the utilization of multiple pedagogies, which allows teachers to address different learning styles of students,[7] many of whom benefit from being able to re-watch video lectures or to enter the digital space from home at their own leisure.[8] And teachers can take advantage of this convenience: all they need to do to check homework is to log into the server at *their* leisure.

Immersive learning is becoming more relevant today.[9] While teaching students with the traditional lecture and note-taking can still be a solid pedagogical approach, it is rapidly beginning to alienate our students, who have already fully bought into the immersive nature of today's technology. Working in virtual environments and 3D modeling, as the project does, appeals to our students' life experience of "losing themselves" in such a digitally immersive world, which is where they have learned to learn.[10] As technology improves, these digitally immersive worlds increasingly provide the participant a greater sense of familiarity with the 3D world,[11] and this heightened sense of familiarity helps to deepen the sense of immersion and strengthen the learning. Immersion into the 3D environment also proves conducive for language learning.[12] Once the environment's language has been customized, the participant is confronted with the target language, which has been superimposed upon nearly every aspect of the environment. Every time the participant selects a material to build with, the name of the material flashes across the screen; when the participant searches for the item in his or her inventory the name again flashes across the screen with

[5] Riedl (2011) 2.
[6] Shiratuddin (2011) 190; Merchán *et al.* (2012) 340.
[7] Zimmerman (2011) 5.
[8] Zimmerman (2011) 6; Merchán *et al.* (2012) 340.
[9] Driver (2008) 2.
[10] de Freitas (2011) 18.
[11] Reeves (2011) 49.
[12] Tan (2011) 215.

every pass of the mouse across the item. The constant association of word to object makes for a stronger memory bond and, ultimately, learning.

Theory

Gee's work on the use of video games in the classroom has played a major role in the shaping of my own thinking and work. He set out sixteen principles of using video games for good learning.[13] I have borrowed from his list to create a more condensed version for the creation and implementation of my project.

Buy-in: Before I began the beta-testing of this project, I ran a simple alpha-test in the Spring of 2014 with four eager volunteers. These students were already players of Minecraft and needed no other inspiration. At first, I naively thought this buy-in would apply to all of my students. Once I began the beta-testing in the Fall of 2014, however, I quickly realized that playing Minecraft in class was of no value to several students. Some students liked Minecraft but had never created something based on research and which required accuracy and creativity. Some students never played, and others did not particularly like video games. Getting these students interested required more than the game itself.

Knowing that the project was for a grade provided some motivation to participate, but I wanted more. Therefore, I showed power points of modern buildings which exemplified Roman architecture as a way to illustrate the present relevance of this project to their lives. Students perked up as they recognized many of the buildings I chose as examples. During one of our field trips to a local university I stopped and talked with students about the Roman architecture on the campus, and I could sense the students' excitement as they recognized the building's architecture and could describe it. I was sure to remind my students that those travelling with me to Rome in the summer would have the opportunity to see "their" buildings in person, and I again witnessed the excitement grow among them. The buy-in had improved but was still lacking. So I utilized my second principle of using games for learning.

Role-playing: I have simplified this multifaceted principle[14] to allow for an easier application to my project by adapting and combining Gee's two categories of

[13] Gee (2005).

[14] Rogers (2011) delineates the long history of role-playing as a successful pedagogy. He argues that role-playing can actually be traced back to Plato's description of the cave and his banishment of Homer in the *Republic*. He later argues in favor of the efficacy of role-playing or "practomime" as is

identity and agency.[15] When playing a role, a person must have some commitment to the new character being portrayed. As is the case with acting, this usually comes about once the performer can identify with some aspect of the role's attributes or backstory. Then the actor may take on this new identity as if it were his/her own. In the Edu version of Minecraft, each student is required to select an avatar upon entering the game. The students choose a gender, skin tone and mode of dress. The selection of an avatar grants a superficial sense of identity which I seek to deepen by requiring that they play the role of either Marcus Vitruvius Pollio or Apollodorus of Damascus (or feminine variants of these names), two architects of their respective times. Students received basic background information regarding their character and were charged with acting and constructing accordingly.

Agency is another concept key for success in such endeavors. In role-playing, after researching the role and developing a sense of personal identity with the character, one must then act out that role within the game world. It is through physical, albeit virtual, action that the student can now live the new identity — e.g., clearing the terrain, creating a blueprint, selecting building materials, recreating buildings block by block — thus strengthening the bond and making the virtual experience more visceral. Whatever happens to the student's avatar is in a sense felt by the student, and can thus elicit an emotional response. By tying student emotions to the gaming experience, longer lasting memories of the

found in games because it contains a performative element that is the bridge to education. Rogers reinforces this performative element by implementing objective mapping at a 1:1 ratio. He further suggests that practomime can be used to teach language to students, an aspect which, regrettably, I only barely touched upon in my own project. He concludes his article with some anecdotal evidence for the success of this pedagogy. Stroessner, Beckerman and Whittaker (2009) provide a detailed description of the theory and application of role-playing. They use the study of the game Reacting to the Past to analyze this pedagogy and support their claims with empirical data (still rather scarce in current scholarship, but see Mulligan (2014) for an application to the Latin classroom). They demonstrate that role-playing can increase student self-esteem and engagement, among several other benefits. Tan and Wong (2011) provide sorely needed empirical data to demonstrate the efficacy of role-playing for language acquisition. Their article elaborates on their implementation of Second Life, a sandbox video game similar to Minecraft, in the Chinese language classroom. Another great project to use role-playing, though not in video game format, in an educational setting with an emphasis on language acquisition is Gellar-Goad (2015). In his article he outlines his successful implementation of a role-playing game in his upper-level Latin composition course at the university level.

[15] Gee (2005) 34–6.

actions experienced are created, along with a deeper understanding of the causes and outcomes of those actions. Once identity and agency work in tandem, students can begin reaping some of the basic benefits of role-playing in an educational setting.

ZPD Progression: Students and gamers share many common features. In particular, they are bored when presented with material that is at or below their present abilities, and they can be induced to anger and sometimes "rage-quitting" when presented with material that is well above their present abilities. Equally, both students and gamers flourish when presented with material that is just a touch above their present means, for, although the challenge presently requires more than they can immediately muster, the realization of a near victory is enough to stimulate and engage the brain's creative centers to search for the right solution. In fact, this area which is just a touch above one's present abilities Vygotsky called the Zone of Proximal Development.[16] This is a zone good video game developers thrive on as it keeps customers eager. During the first iteration of the project, in accordance with the idea of apprenticeship,[17] I was the resident expert, providing students with the scaffolding[18] necessary to achieve their goals.

During the second iteration of the project with the same cohort, some of the scaffolding afforded by my direct assistance was removed. This allowed me to utilize Lim's Zone of Regulatory Development, which is really an extension of Vygotsky's Zone of Proximal Development.[19] In Lim's Zone of Regulatory Development, students make greater use of self-regulation and the established norms of the virtual community to not only behave in a manner established and approved of by the whole but also to begin to look to their peers as experts or scaffolding in the execution of difficult tasks.

Interactive Learning: Once we are able to interact with the material being taught, whether we use our hands, bodies, or minds to manipulate it, we call upon more areas of our brain, which creates a network of connections centered on a new concept or word, and this increases the likelihood of remembering that concept or word. This is precisely what my students were doing. First, students

[16] Vygotsky (1980) 86.

[17] Ormrod (2011) 47–8.

[18] For the concept of "scaffolding," a term used in primary and secondary education, see Ormrod (2011) 45.

[19] Lim (2011) 272.

cognitively interact with the material during the research process; they must constantly imagine how they will implement the research material in a virtual world which they must construct. After their research, students begin manipulating the material in the virtual world while referring to the results of their research for guidance. The interactive learning in this project includes a strong cyclical element whereby students must persistently check and recheck that their creations accurately represent their research and that their research is indicative of their creations, and this cycle helps to create more deeply rooted situational learning, a concept I shall now discuss.

It is under the principle of interactive learning that I sought to make use of Gee's "situated meanings (learning)" in an effort to teach a bit of Latin to my students while they were working on this otherwise socio-cultural project. Using abstract ideas to give meaning and life to new words, whether in one's native language or the target language, is not truly conducive to learning; rather, one must associate the word with some object, and this association occurs in both the physical and the cognitive spheres. As Gee points out, "Games always situate the meanings of words in terms of the actions, images, and dialogues they relate to, and show how they vary across different actions, images, and dialogues."[20] Thus, while students are manipulating their virtual surroundings, by applying Gee's theory of situated meaning I can teach students language at the lexical level by associating new Latin terms with the new images and actions which students experience virtually.

Creating the Virtual Environment

After consulting various maps and models of Rome, I determined that the size of Rome of interest for this project was approximately 5 kilometers square. Since Minecraft's essential building blocks measure at one meter square, my Rome is approximately 5,000 blocks North-South and 5,000 blocks East-West, taking the Colosseum (regrettably, not the Umbilicus Urbis) as the approximate center. DigitalAugustanRome.com was an invaluable resource in determining the appropriate elevations of the different hills, flatlands and river embankments. I adhered as closely to their measurements as possible, and by using WorldPainter,[21] a third party program made for Minecraft, I was able to input the

[20] Gee (2005) 36.

[21] For further information regarding WorldPainter, see http://www.worldpainter.net/.

dimensions for the city, and then to paint the terrain with appropriate elevations and locations.

For the next two steps, I relied heavily on Scagnetti's map, usually considered one of the most accurate.[22] In order to utilize this information, I had to take a high definition photo (1920x1080) of the map, which I then uploaded to my computer. Using WorldPainter, I was able to superimpose the photo of the map onto my rendering of ancient Rome. From here, I had to increase the transparency of the map so I could see my rendering behind it and align the map with my rendering.

In the next step, I used a special paintbrush within WorldPainter to trace a marker for all major landmarks. However, I quickly realized that I needed to make some very difficult decisions regarding building orientation. I have already mentioned that in Minecraft all things are square: trees, the sun, stones and dirt. Further, all building within the virtual space must be aligned to the cardinal directions. Naturally, not every terrain feature or building runs parallel or perpendicular to cardinal directions, so nearly all buildings and terrains had to be shifted to the most closely corresponding cardinal direction. For instance, the actual Roman Forum runs East-southeast but I had to shift it to East. And this, of course, affected all of the surrounding spaces and buildings. Accepting this unfortunate limitation, I began placing the land markers for future buildings for the sake of orientation. I focused on large, well-known buildings/spaces first, such as the Colosseum, the Circus Maximus, the Imperial Fora and the warehouses between the Tiber and the Aventine Hill. For the beta-testing, I placed markers for the known temples of ancient Rome. With the physical space now clearly defined, I needed to address more specific elements to create a more immersive environment.

To further enhance the sense of realism, I utilized the customizable component called the resource pack. The resource pack is what tells the game how to color blocks, based upon their material. These block textures can be customized in nearly any conceivable way. I began this project using a pre-made resource pack, which proved unsatisfactory. Because my goal was to create for my students visual realism to support the history of the era and artistic realism to give

[22] These are the sources I consulted regarding the temples of ancient Rome from its founding until 305 AD: Livy; Ovid's *Fasti*; Dionysius of Halicarnassus' *Antiquitates Romanae*; Vitruvius; the Severan Marble Plan; Lanciani (1893–1901); Platner (1929); Orlin (2002); Stamper (2005); Scagnetti (2006); Coarelli (2007); Claridge (2010).

them familiarity with existing models,[23] I taught myself how to do pixel art[24] and created my own resource pack, entitled "Ars Romana." It contains various marbles, roof tiles, capitals and different types of stone masonry. Within this resource pack is also a language file where I translated the names of blocks into Latin.[25]

Description and Methods

In 2013–2014, during the alpha-testing, I took a poll in all of my classes to gauge student interest in a project such as this, but more specifically to see the gaming background of my student body. Although 90% of 103 students regularly played videogames, only about 40% of these students had ever played Minecraft, and an even smaller percentage — about 14% — considered themselves avid players. I took the same poll in 2014-2015 and received approximately the same results. I had two options to address the lack of experience in Minecraft. The Edu version of Minecraft, which I use, offers a tutorial world in which all of the basics for movement, block selection, building, and destroying are neatly laid out; I could also create my own sandbox and instruct my students in the mechanics of the game. I opted for the second choice, because in last year's alpha-testing I had my students play through MinecraftEdu's tutorial world and found that while it was useful, it was also time consuming. The second choice allowed me to teach the same game mechanics in a sandbox and also prepared my students for precisely the type of building they would be expected to do: Roman temples.

In my sandbox I created a simple, small Roman temple complete with altar and statuary. I circumscribed it with building platforms for the students organized in four columns, one for each cardinal direction, each possessing four rows with five temple bases. I would have the students exactly reproduce my temple on the platform I provided for them. In this manner I could simultaneously teach my students the basic game mechanics and habituate them to the act of model creating. As the students worked on their temples, I could visit with students in real time to check progress and to lend assistance.

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[23] Reeves (2011) 47–9.

[24] Pixel art refers to the creation of art at the rather restricted level of pixels. Essentially one must create art with tiny squares on an equally squared canvas. For Minecraft the squared canvas in which one can create ranges from 8bit (8x8 squares) to 64bit. Higher bits can be used but a graphic enhancer is needed, and none are presently compatible with MinecraftEdu.

[25] The *OLD*; Vitruvius; and Pullen (1894) played a vital role in terminology.

The next step was to set up a server to allow all students to play in the same world in real time. This is a simple process, thanks to the staff of MinecraftEdu, who have automated it. Finally, I disseminated to all of my students copies of MinecraftEdu. Due to the size of the game there is no quick way to achieve this, but for the first iteration I uploaded the game onto a USB Flash Drive and manually downloaded it to each student's computer. I recruited students who had their own Flash Drives to help the process along. For the second iteration I used DropBox — any other such cloud storage service can be utilized — but the time to upload and download is about the same as that of the USB. Getting the student computers ready took about 30 minutes, which I did towards the end of the period and without letting students play that day. We merely tested the system to make sure everything was in working order.

Prior to our first trip to the school's Media Center, I gave students an ungraded, pre-assessment to determine their base line knowledge of Roman temples. I discuss the results of this later. After administering the assessment, I dedicated two ninety-minute class periods to the first project. Students were broken up into groups of two in order to prepare them for the group work necessary for the actual project. I provided scaffolding when needed, and as my more experienced students finished, they also walked around providing assistance to classmates. Since approximately 95% of all groups completed their tasks within the allotted time, I felt confident that a sufficient majority of my students would be able to build in Minecraft.

Before commencing the actual project, I showed my students a series of videos I uploaded to my Youtube channel[26] which detail the major differences between Greek, Etruscan, and Roman temples and cover the major orders and styles of Roman temples that would appear in their own work. I chose to use videos to present this information (rather than lecturing) so that students could refer back to them periodically during their own building process, which allowed me to focus on the more difficult issues. I also gave students some cursory background information on the architects whose characters they were to assume, Vitruvius and Apollodorus of Damascus. (The female equivalents possessed identical biographical information to Vitruvius and Apollodorus.)

For the first iteration, I required that students build only temples, so I provided them with a sign-up sheet for all of the available temples and their locations. Because some temples are very large and better suited for a more experienced

[26] Available at https://www.youtube.com/channel/UCTtKmPD0_Qo9Uy932ZGKFhA.

player, I approved their selections.[27] I then gave each student a form to fill out in order to streamline the information-gathering process since many high school students have not had a great deal of experience with research. The form asked for information like dimensions of temple, building materials, style, order, date built, builder, patron, deity or important figure worshipped, and temple plans. I provided students with a list of acceptable sources — archaeological guides, ancient images, literary evidence — from which they had to choose three, two secondary and one primary. For this step, students had two weeks, and I gave them one class period of 90 minutes. As students finished conducting their research, they had to turn it in to me for verification purposes. Only then could they begin building.

The actual fabrication process, for both iterations of this project, took six class periods (=9 hours). Some students finished in considerably less time; many finished right at the end; and some did not finish at all. Both the research and the actual building of the temple counted as separate project grades for the Fall semester. The temples were graded using a rubric which I shared with students prior to beginning the project.

For the second iteration of this project, I made a few changes. The Fall project showed that nearly half of the students required more step-by-step explanation. Without structured teaching, they often became overwhelmed by the work or distracted by the internet. Several students told me this was because they were not able to find information about their temple; some of this is because high schools rarely have access to the sorts of research tools available at universities, but students also tend to be inexperienced in research. So for the second iteration of the project, I chose one well-known temple — Temple of Portunus, Rome — for everyone and provided each student with a packet of detailed instructions, pictures and plans. (Unfortunately, this meant that for this iteration of the project, the research element was essentially eliminated. However, it also meant that students would be focusing more on using Minecraft to help them learn the material they were recreating.)

[27] Naturally, grading consistently when offering students a choice between easier and more complex buildings becomes difficult. I decided to hold all students to the same standards; those who chose larger projects were typically more ambitious and came to my class outside of their class time to work on the project, and many finished at the same time as the rest of the class.

Another issue which occurred was that some students, although able to find information on their temple, ceased production because they simply were unsure what to do next. I responded to this in two ways. First, Minecraft's Edu version provides a function which allows teachers to create in-game assignments which constantly appear at the top of the students' screens and which they can access by pressing "M" to learn the detailed requirements of each assignment. I made each assignment sequential to the previous so as to streamline the process and reduce confusion and frustration. So, for instance, they were instructed first to build the podium, then the stairs, and then mark where the columns and walls go. Second, I created another video of me building a Roman temple step by step, with commentary. I showed this short video to my class prior to allowing them to build so they could take notes and ask questions as well as have a point of reference.

Results and Data Analysis

Overall the implementation of this video game-based project into my Latin I–IV classes was a success. I have quantifiable evidence resulting from both pre- and post-written assessments as well as image-files of student work demonstrating their improved understanding of Roman architecture. Admittedly there were moments during the first iteration of the project in which some students expressed frustration with either the research element or the game itself. However, by the second iteration I had optimized the research process. Students' prior experience in the Fall seemed to increase their confidence in the use of the game, thereby eliminating most, if not all, of the laments from the first round. During both rounds, but especially during the second round, students began expressing their eagerness to return to the Media Center so that they might continue working on their projects. Some students came to my class during my planning period to work on their projects or start special projects, and a few of these students went on to make and publish video tours of their projects and submit their work to the Spring 2015 NCJCL State Convention; indeed, one student won second place with his model of the Temple of Venus and Roma. Much of my satisfaction with the ultimate outcome of this project can also be expressed in more objective terms as I now turn to analyze the data. The primary focus of the data analysis revolves around student performance on the pre- and post-assessments, written tests given to students before and after instruction and practice.

The school where I work has a Title I[28] designation and recently received a "D" rating for 2013–2014.[29] The school's 2013–2014 ethnicity report shows White 37%, Black 26%, Hispanic 24% and Other 13%. In terms of gender, there are 835 males and 807 females in grades nine through twelve. For this analysis the size of my sample has been set at 49 students made up of mostly lower classmen (freshmen, sophomores and juniors). Although the original intentions were to analyze each student in order to obtain a more accurate picture of the proceedings, successes and shortcomings, student absence prevented individualizing the data.[30] The ethnicities in this sampling are White 63%, Black 24%, Hispanic 10% and Other 2%, and in terms of gender there are 28 males and 21 females. Although I have provided the statistical data regarding ethnicity, I will not perform an ethnicity-based analysis; I offer the information merely to better complete the description of the students in my school and classes. I will, however, analyze students according to gender in an attempt to dispel the adage that females aren't good at video games and/or don't like them.

The pre-assessment was a written assessment consisting of 23 questions ranging from general questions e.g. *What is the purpose of a temple?, What is the typical shape of a temple?* to more specific questions e.g. *What are the Latin words for "temple"?, What are "acroteria"?*. This was administered to my base sample of students before any instruction. The range of the grades for this pre-assessment went from 1% accuracy to 56% accuracy with an average of the 49 students being 13% (3 of 23 answers correct). There was no difference between males and females; both averaged 13%. None of the language-based questions were answered correctly.

The post-assessment was also a written assessment consisting of 35 questions which still ranged from general questions to more specific questions. In fact, many of the questions were identical. Some questions were thrown out since they were never addressed during the two iterations of the project. Instead, I replaced those questions with information I later determined to be fundamental, e.g.

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[28] For a description of Title I, see http://www2.ed.gov/programs/titleiparta/index.html.

[29] For more information regarding North Carolina's School Performance Grades, see http://www.dpi.state.nc.us/accountability/reporting/.

[30] These absences also decreased my sampling pool causing me, regrettably, to do away with a control group, which would have learned about temple building and culture only through traditional means (lecture and selected readings). But a control group has already been established for the 2015–2016 iteration of this project.

students had to label the constituent parts of the facade view of a Roman temple: pediment, frieze, capital and podium. This assessment was administered after all students had submitted to me their final Minecraft projects. The range of grades from the post-assessment were 11% to 80% with 60% being the average score (21 of 35 answers correct). The males averaged a score of 56%, the females 49%.

The post-assessment language-oriented questions were 12 in number and appeared in standard questions and a labeling activity. The range of grades for this section was from 8% to 75% with the average score resting at 33% (4 of 12 correct answers). The words with the highest number of correct responses were frieze (*zoophorus*), capital (*capitulum*), temple (*templum*) and column (*columna*). Several students wrote the first few letters of words suggesting that while they did not possess full recall abilities of the words, they possessed recognition abilities that would have enabled them to interact with the correct materials while in game or provide a correct translation should they encounter the words in Latin.

A comparison of pre- and post-assessments reveals further information. All 5 classes sampled demonstrated growth ranging from 20 percentage points to 38 percentage points with the average being a growth of 29 percentage points. One thing I found interesting was that the females, although they were ultimately outperformed on the post-assessment by their male counterparts, actually showed more growth. The males showed an average change in percentage points of 31 while the females showed an average of 33. While this is certainly no stark contrast, it does lead me to two possible conclusions. In the first place it seems that the anecdote that males are better than females at video games is in jeopardy of being disproven. So too, my data, although admittedly of a very small sample, seems to indicate that females stand to learn more from playing video games. While many will not agree, I should like to think that learning more is at least equivalent to "being better" at video games. At any rate, I am anxious to perform further tests throughout the years with more sampling to determine if there is, in fact, any quantifiable significance behind my findings. Even if they were a fluke, the second conclusion I draw from this finding is that Minecraft has no less proven its ability to be a beneficial supplementation to instruction for both genders.

Reflections and Recommendations for Implementation

Certainly, the end results of this integration of technology into the curriculum are very satisfying. However, this did not come about without stumbling blocks along the way. The element which caused the most issues was the research

project. High school students are typically not yet well-versed in performing research nor do they readily have the means to practice. I found that it was best to use a well-known and well-documented building or area. I recommend first gathering all pertinent information and then placing it in a cloud service which the students can access at their leisure. The packets should include all primary and secondary source material students are to sift through, along with a research guide to ensure they have all data necessary. If questions are structured so as to prompt the kind of research they will need to do, students may also learn more about research in general. To help reinforce their flourishing research skills and supplement their efforts, producing videos with demonstration and explanation is essential. There are several free programs available on the internet to help achieve this end.

A final caution I would add relates to the idea of digital convenience. MinecraftEdu offers teachers the ability to set up a server with the greatest of ease. However, many schools operate behind a firewall which prevents port forwarding[31] to the server. What this means is that the server can only be accessed on a local network, i.e., at school. Some schools will allow port forwarding to make the server accessible by students and the teacher at home. This is one of the more attractive aspects about digital convenience. Without it, students cannot work outside of school, and any work the teacher wishes to do at home must be saved to a file which is later uploaded to and merged with the school-side server (and this introduces the potential for lost work).

Thus far, I have only described the full scale implementation of this project, but there are other less labor-intensive variants that can be used in history or foreign language classes. A reconstruction of a Forum could be a class effort which would take relatively little time to complete, and the rest of the project could be dedicated to teaching Roman daily life through researched role-playing: courts, the creation of laws, the freeing of slaves, proscriptions, shops, etc. All of these smaller scale builds would grant more opportunities to the instructor to tap into role-playing's language teaching potential.[32]

This project's use of a virtual environment to create a 3D realization of ancient cultures seems to evince the potential of its pedagogical efficacy and to present

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[31] For more information regarding port forwarding and how to set it up, see http://portforward.com/softwareguides/minecraft/portforward-minecraft.htm.

[32] See Rogers (2011), Tan and Wong (2011) and Gellar-Goad (2015)

itself as one way to keep the Classics relevant in the ever advancing and mutating world of technology. With the same or a similar project as this one, teachers are equipping their students with 21st century skills transferable to the immediate job market and/or to higher education. I find that the best part of implementations of this sort is that while we are educating our students about and through technology, a medium all too familiar to today's generation, we are also promoting the study of the Classics. After taking a poll the first day of class during the Fall of 2015 to discover why students had chosen Latin, many of them said they chose Latin because they heard they would get to build and learn about Rome through Minecraft. In fact, many students approached me with ideas for what they would like to build next.

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WORKS CITED

Bauman, Eric B., and Games, I. Alex. 2011. "Contemporary Theory for Immersive Worlds: Addressing Engagement, Culture, and Diversity." In A. Cheney and R.L. Sanders, eds. *Teaching and Learning in 3D Immersive Worlds: Pedagogical Models and Constructivist Approaches*, pp. 248–70. Hershey, PA.

Bukvic, Ivica Ico, *et al.* 2014. "OPERAcraft: Blurring the Lines between Real and Virtual."

Claridge, Amanda. 2010. *Rome: An Oxford Archaeological Guide*. Oxford.

de Freitas, Sara, Dunwell, I. and Rebolledo-Mendez, G. 2011. "Learning as Immersive Experience: Learning and Teaching Practices in the Virtual Worlds." In A. Cheney and R.L. Sanders, eds. *Teaching and Learning in 3D Immersive Worlds: Pedagogical Models and Constructivist Approaches*, pp. 15-30. Hershey, PA.

Coarelli, Filippo. 2007. *Rome and Environs: An Archaeological Guide*. Berkeley, CA.

Driver, Erica and Driver, Sam. 2008. "Make Tactical Moves Today for Strategic Tomorrow." *ThinkBalm: Immersive Internet Analyst Report Series.* No. 1 (17 Nov. 2008) 1–22. Available at <https://thinkbalm.files.wordpress.com/2008/11/thinkbalm-immersive-internet-report-nov-20084.pdf>

Gee, James Paul. 2005. "Good Video Games and Good Learning." *Phi Kappa Phi Forum* 85: 34–7.

Gellar-Goad, THM. 2015. "World of Wordcraft: Foreign language grammar and composition taught as a term-long role-playing game." *Arts & Humanities in Higher Education* 14: 1-15.

Gueder, Patrick (Patrick (パトリック)). 2014. "Minecraft console editions together just passed Minecraft for PC/Mac. And across all platforms we've sold almost 54 million copies." 25 Jun. 2014, 7:52 a.m. (tweet).

Lanciani, Rodolfo. 1994. *Forma Urbis Romae.* Oxford.

Lim, Kenneth Y.T. 2011. "What are Avatars Made of? Fictive Worlds and the Zone of Regulatory Development." In A. Cheney and R.L. Sanders, eds. *Teaching and Learning in 3D Immersive Worlds: Pedagogical Models and Constructivist Approaches*, pp. 271-87. Hershey, PA.

List, Jonathan and Bryant, B. 2014. "Using Minecraft to Encourage Critical Engagement of Geography Concepts." *Society for Information Technology & Teacher Education International Conference*. Vol 2014: 2384-2388.

Merchán, P., *et al.* 2012. "Acquiring Fragments of the History: Using 3D Models in the Teaching-Learning Process." INTED2012 Proceedings: 6th International Technology, Education and Development Conference. 5–7 March, pp. 335–42.

MinecraftEdu. Teacher Gaming LLC. 2015. <https://minecraftedu.com/software>

Mulligan, Brett. 2014. "Coniuratio! Ethopoeia and 'Reacting to the Past' in the Latin Classroom (and Beyond)." *CJ* 110: 107–123

Orlin, Eric M. 2002. *Temples, Religion, and Politics in the Roman Republic*. Leiden.

Ormrod, Jeanne Ellis. 2011. *Educational Psychology: Developing Learnings (7th Edition)*. Boston.

Platner, Samuel Ball. 1929. *A Topographical Dictionary of Ancient Rome*. Oxford.

Pullen, Henry William. 1894. *Handbook of Ancient Roman Marbles; Or, A History and Description of All Ancient Columns and Surface Marbles Still Existing In Rome, With a List of The Buildings in Which They Are Found.* London.

Reeves, A. and Minocha, S. "Relating Pedagogical and Learning Space Designs in Second Life." In A. Cheney and R.L. Sanders, eds. *Teaching and Learning in 3D Immersive Worlds: Pedagogical Models and Constructivist Approaches*, pp. 31–59. Hershey, PA.

Riedl, Richard E., McClannon, T. and Cheney, A. 2011. "Moving to the World^{virtual}: Affordances of 3D Immersive Environments for Teaching and Learning." In A. Cheney and R.L. Sanders, eds. *Teaching and Learning in 3D Immersive Worlds: Pedagogical Models and Constructivist Approaches*, pp. 1–14. Hershey, PA.

Rogers, Travis. 2011. "Practomimetic Learning in the Classics Classroom: A Game-based Learning Method from Ancient Epic and Philosophy." *NECJ* 38: 25–42.

Scagnetti, Francesco, and Grande, Giuseppe. 2006. *Roma Urbs Imperatorum Aetate.* Rome.

Schifter, Catherine and Cipollone, M. 2013. "Minecraft as a teaching tool: One case study." *Society for Information Technology & Teacher Education International Conference*. Vol. 2013: 2951-2955.

Severan Marble Plan. *Stanford Digital Forma Urbis Romae Project*. Available at http://formaurbis.stanford.edu/index.html.

Shiratuddin, Mohd Fairuz and Hajnal, A. "3D Collaborative Virtual Environment to Support Collaborative Design." In A. Cheney and R.L. Sanders, eds. *Teaching and*

Learning in 3D Immersive Worlds: Pedagogical Models and Constructivist Approaches, pp. 185–210. Hershey, PA.

Stamper, John W. 2005. *The Architecture of Roman Temples: The Republic to the Middle Empire*. Cambridge.

Stroessner, Steven J., Beckerman, L.S. and Whittaker, A. 2009. "All the World's a Stage? Consequences of a Role-Playing Pedagogy on Psychological Factors and Writing and Rhetorical Skill in College Undergraduates," *Journal of Educational Psychology* 101: 605–20.

Tan, Seng-Chee, and Wong, Yin-Mei. "Learning Language Through Immersive Story Telling in a 3D Virtual Environment." In A. Cheney and R.L. Sanders, eds. *Teaching and Learning in 3D Immersive Worlds: Pedagogical Models and Constructivist Approaches*, pp. 211–25. Hershey, PA.

Vygotsky, Lev Semenovich. 1980. *Mind in society: The development of higher psychological processes*. Cambridge, MA.

Zimmerman, Isa Kaftal. 2011. *Digital Content Strategy Guide*. Folsom: eRepublic. Available at http://www.dell.com/downloads/global/solutions/ public/articles/ Digital_Content_Strategy_Guide_final.pdf