The Metaverse as a Technological Fix: An Analysis on the Quality of College Education

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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STS Research Paper

Imagine a virtual world absent of the need to wake up several hours before an event to look up to a rather arbitrary standard. The described hypothetical scenario can only be relevant in the metaverse which is a 3D virtual space where people interact and communicate through avatars that are created and customized with the touch of a button (Hendaoui et al., 2008). On an industry level, as digitalization becomes increasingly important amongst firms who compete to maximize profits, the implementation of the metaverse presents a lucrative opportunity. In particular, Meta and Microsoft—led by CEO Mark Zuckerberg and Satya Nadella, respectively—are partnering to "unlock new possibilities for the future of work" after building the foundation of a secure metaverse (Teper, 2022). The outreach of its use is not limited to the corporate world but also extends to the college education space.

Through employing the metaverse in college education, the transfer of knowledge is no longer hindered by the spatial constraints of a physical classroom. Additional benefits include the development of a more personalized curriculum which can provide a more enriching educational experience for students. The ubiquitous nature of the metaverse, however, delegates a copious amount of power to leaders in technology, stripping experts in their respective academic fields of any voice and further bifurcating the quality of education delivered to lower- or upper-class students. This paper explores the role of the metaverse as an effective technological fix which is evaluated through an analysis of Zoom and Second Life as metaverse platforms. Using a political framework, the effect of the transfer of power away from college educators to tech giants in the shaping of the future of education is further assessed.

Researching the Impact of the Metaverse on College Education

To what extent does the use of the metaverse serve as a technological fix to solving the deeper issues embedded within the structure of college education?

The paper begins with a discussion of the limitations of the metaverse in the college education space, underscoring the semi-incompatible nature of the intersection between technology and pre-existing societal structures. Following the introduction, background information regarding the breakdown of the four main categories that compose the metaverse and their respective practical uses is provided. Keywords that guide the research include the metaverse, college education, virtual worlds, technological fix, and politics. Next, the statement of overarching goals of the education system, as defined in relation to the objectives of the American Association of Colleges and Universities (AACU), sets up the discussion surrounding determining the efficacy of the metaverse in improving the overall quality of education. To conclude the first portion of the paper, the STS frameworks used to characterize the analysis, more specifically technological fix, and the use of technology as a political tool, are defined and elaborated.

History of the Metaverse

The word “metaverse” was first used in a science fiction novel, *Snow Crash*, by Neal Stephenson in 1992 where characters, as represented through avatars, work in a 3D virtual reality space named the metaverse. Fourteen years later, the Acceleration Studies Foundation (ASF) characterized the concept of the metaverse as a connection point between the real world and virtual reality. Generally, the metaverse is split into “augmentation versus simulation,” and “intimate versus external”; augmentation refers to new technology added to a pre-existing real system whereas simulation includes the creation of a simulated world that is conducive to interaction. The metaverse is further bifurcated into an inner and external world, where the inner world focuses on the behavior of an individual whereas the external world displays information about the individual’s surroundings (Kye et al., 2021).

There are four main types of the metaverse, as defined by the ASF: augmented reality, lifelogging, mirror worlds, and virtual worlds. Augmented reality involves overlaying objects in the real physical world to make them appear in 3D. In education, augmented reality is used to allow students to learn invisible parts through displays of digital information and gain a better visual understanding of complex material. Lifelogging refers to the documentation of one’s daily life through social media which can lead to greater reflections on learning and a more personalized direction based on individual struggles. A mirror world involves converting the real world into a virtual world which effectively expands the real world through overcoming spatial limitations of teaching through tools like Zoom. Finally, virtual reality creates a digital environment for characters to act as avatars, creating immersive experiences that would otherwise be too expensive in real life like performing surgery (Kye et al., 2021). The increasing

use of virtual reality in the education space is exemplified through a virtual-world platform, Second Life, where students can interact and collaborate in a fully immersive digital setting.

Goals of the College Education System

By delineating the specific goals intended for college educators, the method of analyzing the metaverse's efficacy in advancing the quality of education is more grounded in concrete and widely accepted guidelines. The use of the subsets of the metaverse aims to accomplish the five main desired outcomes established by the American Association of Colleges and Universities that are outlined below (Ehrmann, 2004).

1. Develop strong analytical, communication, quantitative, and information skills
2. Cultivate a deep understanding of and hands-on experience with the inquiry practices of disciples that explore the natural, social, and cultural realms
3. Obtain intercultural knowledge and collaborative problem-solving skills
4. Gain a proactive sense of responsibility for individual, civic, and social choices
5. Foster integrative thinking and the ability to transfer skills and knowledge from one setting to another

The current education model involves a "centralized-control model" where instructors deliver information to a class of students which causes students to take a more passive role in learning new material. Additionally, students within the same discipline frequently interact and communicate with each other, preventing the cultivation of an interdisciplinary environment that promotes integrative thinking. There is also currently a large emphasis on the memorization of theoretical concepts, hampering the development of practical skill sets (Kluge and Riley, 2008).

The emerging technological advancements, or rather virtual worlds, aim to resolve the main issues that deviate from the outlined goals within the current college education structure.

Technological Fix and the Politics of Technology

There are two main frameworks that are used to analyze the social impact of the metaverse: technological fix and the use of technology as a political tool.

The technological fix describes "the use of technology to respond to certain types of human social problems that are more traditionally addressed via political, legal, organizational, or other social processes" (Rosner, 2013). While technological fixes plant a temporary solution to a problem, they fail to address the root of the problem and therefore simply mask growing underlying issues. Analysis in the field of Science, Technology, and Society (STS) using a technological fix lens is widely performed. For example, Peter G. Brewer, a prominent Ocean Chemist and Senior Scientist at Monterey Bay Aquarium Research Institute (MBARI), evaluates the potential solutions of geoengineering the Earth's climate system through the injection of stratospheric sulfate aerosols to artificially cool the Earth. He further discusses models that prove the use of injection as a technological fix, as its cessation creates a dramatic increase in the rate of global warming when compared to never implementing the technology at all (Brewer, 2007). Other scholars like William D. Pflaum, author of "The Technology Fix: The Promise and Reality of Computers in Our Schools", describe computer usage in schools as a technological fix, interviewing teachers at schools to better understand the structure of the classroom with computers and the daily issues that impact the quality of delivered education (Pflaum, 2004). Barthe, Elam, and Sundqvist further assess the technological fix of disposal processes of nuclear waste in Sweden complimented by France's desire to unravel the technological fix through legislative demands for reversible disposal (Barthe et al., 2020). These three authors recognize

the futility of including specific technologies as temporary solutions. However, they fail to provide concrete solutions to mitigate the detrimental impact of utilizing such technological fixes.

Another powerful analytical tool used in the field of STS is viewing artifacts as political, as some innovations are used as a means for exerting power, authority, or privilege to settle issues in communities. The conception of nuclear weapons, for example, generates immense power for political leaders as they single-handedly hold the decision to obliterate the global population. Marc Berg from Maastricht University explores the consequences of different conceptualizations for design and their use as political leverage (Berg, 1998). Author of "The Politics and Technology of Nuclear Proliferation", Robert F. Mozley, further evaluates the intersection of politics and technology in the attempt to prevent nuclear proliferation. He more specifically reviews the methods used to examine the power dynamics between countries involved in the trade of nuclear weapons (Mozley, 1998). Both authors agree that certain technologies are developed with the underlying intention to solve political issues and acknowledge the impact of transferring power amongst different entities. Yet, there is limited discussion surrounding the social issues that arise among individuals, which represent an abundant yet impotent stakeholder, who are subjected to the rules of authoritarian regimes.

Using the technological fix lens, the paper further analyzes pre-existing case studies discussing the qualitative and quantitative net value of integrating the metaverse into the college education space. Simultaneously, the analysis of the resulting transfer of power from educators to tech giants advances a deeper understanding of the role of the metaverse as a political tool.

The Net Value of the Metaverse on College Education

In early 2022, Mark Zuckerberg announced that it could take just five to ten years before the key features of the metaverse become an irreplaceable part of life (Snider and Molina, 2022). The imminent decision favoring the widespread integration of the metaverse, therefore, warrants the need for scrupulous analysis of its impact on the exacerbation of education inequity. By comparing the benefits and limitations of the use of the metaverse in the college education space to AACU's goals, the metaverse is determined to serve as a temporary solution to the pre-existing educational structural issues. However, the heavy reliance on high-speed connectivity causes students from low-income backgrounds to receive a lower quality education than those from higher-income backgrounds. The effectiveness of the metaverse as a technological fix worsens with more complex models, like Second Life, and it simultaneously widens the social chasm that is exacerbated by the transfer of power from educators to tech giants. Potential solutions to reduce the extent of the widening involve greater collaboration between tech giants and educators, and the incorporation of risk-based tasks in the virtual-world setting.

The Role of the Metaverse as a Technological Fix

The immersive nature of the metaverse creates a 3D learning space where users can experience online education through avatars with aspects of the physical world still present (Lee et al., 2022). Extended reality, which combines VR and AR, provides an environment where users can design and construct virtual buildings, or perform virtual surgery to simulate a real-life operation. The utilization of digital technology thereby allows for a more in-depth exploration of real-life applications of the gained knowledge. Virtual worlds additionally shift the traditional structure from a teacher-centric model to a student-centric model where the students direct their own course, creating a more personalized curriculum that is tailored to the learning speed of each

student. The resulting shift enables students to adopt an active approach to learning where the pacing of knowledge transfer is driven more by the student's understanding of a topic rather than by an instructor's opinion of a student's understanding. Through the utilization of an active-learning model, students develop greater integrative thinking skills which suggests that the use of the metaverse satisfies the goal of "foster[ing] integrative thinking" that is outlined by the AACU. The metaverse bolsters the cultivation of strong analytical skills and instills a deeper understanding of course material through hands-on experiences. By eliminating the physical barriers of education, the use of the metaverse enhances the collaboration aspect of learning through increased access to other students or teachers.

While the use of the metaverse addresses most goals set forth by the AACU, it fails to instill a proactive sense of responsibility in students. In the metaverse, students experience a virtual environment or simulation that enables them to build a house or fly an airplane with minimal or no risk (Kye et al., 2021). For example, making an error in a surgery-based simulation environment is not as consequential as when the error is in a real-life setting with a real patient. Even though the applicative connotation of the new form of education in the metaverse strengthens practical skills, the lack of consequence strips the student's regard for responsibility which creates uncertainty regarding the student's ability to perform under pressure in the physical world. Nevertheless, the use of the metaverse temporarily serves as a viable solution to the current form of passive education, masked by the unintended social repercussions of its eventual widespread use.

The Use of the Metaverse as a Political Tool

Although the implementation of the metaverse in the college education space converts the passive nature of the traditional education structure to active, its use raises a plethora of

challenges. The first involves the need for high-speed internet connection which builds impregnable barriers for students from low-income backgrounds, as well as for students around the world who simply do not have access to the same network services as those available in the United States.

A study at the Rajamangala University of Technology Thanyaburi shows that students with Wi-Fi slower than 4G mobile internet had a 9.78% cognitive increment as opposed to students with high Wi-Fi speeds that had a 38.85% cognitive increment (Pigultong, 2022). The difference of approximately 30% in attained cognitive ability is noteworthy, as the speed of internet service heavily influences the effectiveness of the delivery of education. Further, internet connectivity is positively correlated with socioeconomic status under the general assumption that students with more money can and will pay more for higher internet speeds. The students from lower social classes are therefore hindered by slower internet which translates to a lower gain in cognitive ability. The increased reliance on technology to attain knowledge suggests that students in the lower class have minimal power over the trajectory of their educational journey and corresponding career success. Additionally, the high cost of implementation and membership worsens overall equal access to education as wealth becomes the determining factor in accessing knowledge. Despite providing opportunities for students to gain greater problem-solving skills through application-based assignments and self-guided learning, the widely inaccessible design of the metaverse epitomizes the inequity in education.

An Analysis of Zoom as a Technological Fix

During the COVID-19 pandemic, teachers and students were forced to modify the previous style of teaching to satisfy the requirements of social distancing through the use of E-learning platforms like Zoom or Microsoft Teams. The integrated use of Zoom enables students

to obtain education from any desired setting without experiencing the intense pressures of looking a certain way, emphasizing greater flexibility and promoting the development of a newfound sense of confidence. Additionally, having the option to re-watch recorded lectures facilitates the process of gaining a deeper understanding of academic material in a more stress-free way, isolated from the fast pace of simultaneous notetaking (Sayem et al., 2017). The adaptive nature of education, as shown through its online transformation, suggests that the intrinsic essence of transferring knowledge is dynamic. Thus, the introduction of Zoom seemingly advances the innovative approach toward the traditional blackboard method of instruction where students passively absorb information.

While the use of Zoom eliminates spatial limitations and provides greater flexibility for students and educators, it ultimately led to decreased academic performance which weakens its role as a technological fix. In a study performed on 551 West Point students, online instruction reduced the average student's final grade by 0.236 standard deviations, relative to classes that were in person, which corresponds to approximately ½ of a letter grade (Kofoed et al., 2021). The results show that there is a gap between learning from online instruction and in-person, as evidenced by the decline in academic performance. More specifically, for students in the 25th and 50th percentile, the final grades in online coursework were reduced by standard deviations of 0.225 and 0.351, respectively. The failure to compare and match knowledge retention goals suggests that Zoom does a worse job at satisfying the goals outlined by the AACU, especially considering the metric of academic performance. Thus, when evaluating an already-implemented form of the metaverse, the failure of mirror worlds, like Zoom, to increase student intelligence implies its role as a broken technological fix.

An Analysis of Zoom as a Political Tool

With platforms like Zoom, there is an increased dependency on functioning internet services and the infrastructure created by parent firms which severely limits the quality of received education to technology-based factors. Studies show that 40% of students face difficulties regarding connection speed as the transfer of education becomes hampered when using the Zoom application (Minhas et al., 2021). As a result, the strong reliance on Zoom for the future of education indicates that the success of knowledge-transfer is heavily dependent on the ability of tech giants to develop bug-free software. The corresponding decrease in power in college educators limits their role in dictating the trajectory of education which limits progress in the field of educational development. Additionally, Zoom's effectiveness in seemingly deepening the understanding of the material is negated by its role in widening the gap in the quality of education between the lower- and upper-class, especially when considering the overarching goal of providing equal access to education. The transfer of power from educators to tech giants, whose goals primarily consist of maximizing profits without heavily factoring the notion of equitable access to such platforms, results in a modification of the mission statement surrounding education; the initial objective of providing a higher quality of education to the greatest number of students transforms into a goal of maximizing monetary gains from selling licenses to access platforms like Zoom. The resulting powerless stance of professors and students, created from arising technical issues, indicates an inversion of the pre-existing power structure where professors lose complete control such that the interests of students are no longer prioritized.

The utilization of Zoom for educational purposes hinders the ability of students to strongly develop communication skills despite providing increased flexibility. Further, students

are not as involved in obtaining hands-on experiences when it comes to learning given the virtual nature of the platform. When considering the lower collaboration stemming from the lack of face-to-face interaction, Zoom's use does not satisfy most of the intended goals set forth by the AACU, displaying its role as a relatively ineffective technological fix. The resulting secondary consequence from its use further bifurcates the quality of education delivered to the upper and lower classes, creating net harm to the education sector.

An Analysis of Second Life as a Technological Fix

Second Life (SL), a 3-D environment made by Linden Labs, serves as an ineffective technological fix due to its highly complex infrastructure which limits student usability and interaction. In SL, avatars interact and can buy land, as well as travel to different "islands" for a small fee. The use of virtual worlds in universities like Case Western Reserve and the Massachusetts Institute of Technology (MIT) proves how SL can serve as an entry point in catalyzing the establishment of a widespread presence in a 3-D virtual world for educational institutions. In the virtual campuses, several replicas of buildings are created, along with in-person tours, athletic fields, and residence areas (Wongtangswad, 2008). The formed 3-D virtual world thus accurately replicates the physical environment, providing an easier transition for student users. Students can still interact with each other and work collaboratively on school projects, with interactions largely limited by the total amount of users.

In a case study performed by the University of Manchester Business School, 38 undergraduate students were selected to use SL as a means of communication and collaboration to organize a virtual world event (Alrayes and Sutcliffe, 2011). Blackboard was also used for discussion boards where technical support was provided for the design phase of the project.

Lectures were provided over the SL platform that discussed project management, leadership, and a smorgasbord of topics that ensure success in post-graduation life.

Survey results regarding the overall experience in SL show that students generally feel that they are not more actively involved in the courses and there is minimal improvement in learning despite having easier communication (Sutcliffe and Alrayes, 2012). The impact of SL's use further indicates that student interactions are not as natural as face-to-face and very little importance is given to preserving anonymity within virtual identities. As a result, students lack the development of strong social and communication skills that are essential in learning how to tackle complex problems. Second Life, therefore, serves as a poor solution for the advancement of the quality of education through new technologies. Interestingly, students conveyed that they are more likely to skip classes with course materials available online. The issues primarily stem from usability problems specific to the platform, suggesting the need for increased attention to the relatively new SL software; in comparison to Zoom, there are a lot more areas that are faulty and require more meticulous coding which significantly limits SL's educational reach. In fact, SL is rated as slightly negative regarding the effectiveness of gaining knowledge, showing tremendous room for growth in terms of its structure and intended purpose, as well as its inefficacy as a technological fix.

While SL satisfies the goal of increasing collaboration and analytical thinking, the relatively chaotic nature of its use for group projects further hints at the overwhelming benefits of face-to-face communication. Additionally, the lax code of conduct on virtual behavior fueled by the anonymous feature made the environment more game-like which defeats its purpose as an educational platform. The use of SL thereby provides an ineffective temporary solution to solving the structural issues in the college education space relative to Zoom and in-person

education, as it falls short of addressing the goals outlined by AACU. The role of the metaverse as a technological fix consequently diminishes in increasingly complex software and networks.

From an educator's perspective, several professors were surveyed on the integration of SL and LMS (Learning Management Systems) regarding its effect on teaching (Livingstone and Kemp, 2007). Using the SL platform, educators can build their own domain-specific settings and easily modify the created environment. Out of the users who already integrated LMS into their curriculum, 94% said that SL was best for synchronous chat with 85% saying that it was best for live presentations or classes. From an educator's standpoint, therefore, there are greater benefits to using SL to engage and communicate with students. Second Life breaks down that barrier that occurs in a physical classroom setting where students are more anxious to speak up. However, the surveyed sample size is biased towards early adopters of the new platform who are generally more tech-savvy and who express greater enthusiasm for changing the traditional way of education. The net value remains largely negative given the relatively young and complex nature of the SL-metaverse world.

An Analysis of Second Life as a Political Tool

Given the high costs associated with having a membership to SL, only the universities with the greatest levels of funding can afford its annual renewal and utilization. Relative to Zoom, SL represents a larger portion of the university's annual budget if put into implementation. Additionally, considering the profit-maximizing goals of tech giants, prices could continue to stay high for the foreseeable future such that tech giants gain some control over the future pricing of college education. With SL specifically, the cost hurdle is much larger relative to Zoom given the complex infrastructure of the platform, resulting in an even greater difference in delivered education quality amongst various social classes (Jennings and Collins,

2007). Considering the pre-existing goal of ensuring the maximum amount of people can get access to a quality education, the knowledge gap between lower- and upper-class students amplifies drastically with minimal ability for educators to resolve the crisis due to their now powerless stance. The additional decreased level of widespread accessibility and overall lack of satisfaction from a technological effectivity standpoint prove that a virtual world of such nature has a net detrimental effect on the future of education. Major additional considerations are imperative before allowing the virtual-world form of the metaverse to dominate the college education space, with some suggestions outlined below.

Potential Solutions to Mitigate the Power Transfer Effects

While the metaverse provides an innovative approach to learning through immersive experiences that cultivates practical skills, the resulting bias toward the wealthier class displayed in increasingly complex networks like Second Life eradicates its overall societal net benefit. Thus, the following solution is proposed to mitigate its detrimental effects:

1. Create a continuous feedback loop system where educators can provide constructive criticism and input on the direction of their courses.
2. Achieve economies of scale with the metaverse product before rolling it out to institutions to ensure that all universities can access such platforms so that prices are more affordable.
3. Enforce a hybrid curriculum where the days are split between metaverse education and traditional classroom education to limit the imbalance of power.
4. Provide ample training opportunities and resources for both educators and students to ensure that technology and tech giants forces do not become dominant.

5. Incorporate a component of real risk in virtual classes so that the students can gain a sense of responsibility from their actions in the real physical world.

Implementing the listed suggestions lessens the harm caused by the newly concentrated power within tech giants as educators gain back some autonomy in guiding the future of education. With these considerations in mind, it is nevertheless important to maintain the creative and immersive environment provided by VR and AR, yet it takes time to create a secure network where security and codes of conduct are prioritized and effectively implemented.

Limitations of the analysis include relying more on qualitative sources in determining the net societal value of the metaverse and utilizing data from a relatively small and dated sample in the Second Life case study. Other potential drawbacks to the analysis include a lack of information of quantitative metrics of student performance in virtual worlds and limited feedback from educators using online platforms. Future areas to bolster the analysis include gathering more quantitative data from student experiences in SL to better determine the efficacy of the metaverse on retained knowledge, as well as the use of more surveys from college educators and leaders to gauge enthusiasm amongst the different stakeholders. Additional areas to explore involve using actor-network theory and risk analysis to fully understand the linkages between the different actors at play and the most effective ways to communicate with the public regarding highly technical information, respectively. Utilizing a greater variety of sources other than literature reviews and scholarly articles can also enhance the quality of the analysis as new perspectives are discussed.

The Inefficacy of the Metaverse as a Technological Fix and Political Tool

The utilization of the metaverse in the college education space fosters a space for increased creativity and immersion that enables a student-led learning experience that is supplemented by hands-on activities. While satisfying some of the goals set forth by the AACU, platforms like Zoom and Second Life exacerbate the divide in the quality of education delivered to upper-class versus lower-class students; in fact, the most complex discussed version of the metaverse (SL) serves as an impediment to improving the transfer of knowledge which insinuates its inefficacy as a technological fix. From a political perspective, the shift of power from educators to tech giants increases the widespread inaccessibility of virtual education given the profit-maximizing goals of leaders in the technology space. A potential solution to mitigate the harmful and noteworthy consequences of the resulting transfer of power includes implementing a hybrid educational model where educators are not entirely dependent on technology. As firms compete to represent the face of the metaverse, it is important, as individuals, to decelerate the momentum that is fueled by the abundant enthusiasm surrounding innovation through thorough sociotechnical analysis.

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