

Educational Inequality: The Role of Digital Learning Resources

Bo Xin Zhao

*Shanghai American School Puxi, Shanghai, China
Boxin01px2025@saschina.org*

Abstract: The digital technologies employed in education have skyrocketed due to widespread online learning during the pandemic. Subsequently, the recent development has brought into question whether new digital learning resources – online tools that students can use to supplement their learning – challenge the century-old class inequality in education. As we return to face-to-face learning, it is critical to evaluate whether digital resources can be combined with conventional school resources to uplift students' academic achievement in low-income households. The methods of literature review of past papers and theoretical investigation are applied in this paper to discuss empirical observations and offer explanations. Sources of materials include the United States Census Bureau and the National Center for Education Statistics. By synthesizing classical Bourdieu's theory of capital and a nascent digital pedagogical framework, the author finds that, contrary to popular clamor, digital learning resources are not benefiting the lower class significantly. In fact, digital inequality is emerging from three compounding factors: access, surroundings, and the self. By discussing the learning environment, parents' background, self-regulation, and motivation, this paper not only underscores the interacting components that amount to the corruption of meritocratic education but also advances the inquiry into online resources and possible future pathways for the empowerment of low-income students.

Keywords: digital learning resources, online learning, low-income, inequality, digital divide

1. Introduction

“For all the times I couldn’t turn to my parents for homework help, I had Khan Academy videos to help me. Khan Academy was the private tutor that my family could not afford.” – First generation Stanford Student [1]. Digital learning resources such as Khan Academy and other online tools are often hailed as the panacea for educational inequality – an unprecedented means for the disadvantaged to strengthen academically. This claim assumes that technology injected into our society can trickle down to offer a hand to those most in need. This study will question the true significance of the emergence of digital learning resources for lower-class American students. It will provide a perspective to explain the nuances of the novel phenomenon unfolding before our eyes.

Digital learning resources, online reservoirs of academic knowledge, are tools to support, supplement, and extend the educational system. While wholly online learning was implemented during COVID-19, digital learning resources generally refer to any digital material that can enhance learning by directly teaching students or assisting educators in the classroom. The term digital learning is an umbrella term that includes mobile learning, online learning, and e-learning[2]. It

comprises mediums including but not limited to the web, web-based teleconferences, web-based courses, and mobile applications; essentially, digital learning refers to anything that enhances learning through information and communication technology. Popular examples include Youtube, Coursera, edX, Khan Academy, Udemy, IXL, Quizlet, and MIT OpenCourseWare[3].

Recent trends show the proliferation of digital learning resources in the United States. The pandemic forced nearly all schools and universities online in America in most of 2021 and 2022. While this shift upended the lives of many disadvantaged students, online learning enthusiasts point to the silver lining; there has been a skyrocketing demand for accessible digital learning technologies. Massive multi-national organizations competed to refine their learning platforms and offer lower prices. Many offered numerous courses for free and saw a subsequent surge in users. Global education-technology investments are projected to reach \$350 billion by 2025 [4]. Moreover, due to public demand during enforced lockdowns, institutions at the state and district level have turned greater attention to distributing tools to access the Internet, such as computers and WiFi. This development has consequently allowed numerous students to access previously limited educational resources. For these reasons, our education system and society are at a pivotal juncture. Thus, this research paper – written during a post-Covid America – is timely and provides much-needed analysis and insight on the ongoing and resulting developments of digital learning resources for the lower class.

So-called meritocracy and fairness in society's educational institutions have always been labeled as unfair, as proven by the myriad of past research showing the advantages of higher socioeconomic class in attaining academic achievement. Established sociologists such as Bourdieu developed the idea of capital, notably cultural capital, wherein higher social classes have better habits and transfer those to their children, thereby enforcing the educational caste system[5]. However, the recent prominence of digital learning resources due to the proliferation of electronic devices and online learning has led researchers to question whether educational inequality is loosening its claws on low socioeconomic class students.

Intuitively, the combination of education and technology has formed a powerful resource for all students. Furthermore, the COVID pandemic was spearheading the popularity of e-learning[4]. In light of this rapidly transforming landscape, researchers have become interested in the learning outcome of online learning, especially for low-income or disadvantaged students. Emerging theories posited a three-layer digital divide regarding the multiple layers of digital inequality emerged[6]. The first two layers of the theory focus on the inequality in access to resources, and the third measures digital outcomes. Due to the ease of measuring the inequality in access, recent research has predominantly focused on how low-socioeconomic-status students often do not have an adequate device or Internet connection[7]. Many studies lack a discussion of multifaceted factors going into a study environment, such as noise, distractions, and parental availability – all of which this paper will discuss. Still, across these studies, there is strong evidence that inequality in access was a barricade to equal learning during the pandemic[8]. Nonetheless, studies rarely go beyond physical access, so this research paper strives to measure the psychological, communal forces that impact on a student's self-regulation and motivation. Additionally, past research has emphasized the learning outcome inequality during the COVID pandemic, including inequality in assessment scores and engagement[9]. These studies focused on students being forced to learn online without preparation but are less relevant in a post-COVID society, where students may select supplement resources – digital learning resources – to aid their face-to-face learning instead of being suddenly forced to learn online.

By examining past papers, analyzing data from national centers for statistics, and investigating various theories, this paper discusses whether and to what degree trends of the development of online resources influence the educational success of economically disadvantaged students. While the rise in digital learning resources has generated a net benefit for low-income students due to its widening

accessibility and innovative techniques, poor students have not been substantially benefited. Especially compared to wealthier students, their unfavorable studying environments, their uncondusive community, and their shaky learning habits are all caused by class inequality and inequalities in various types of capital. The main body will begin by diving into the prerequisite to digital learning resources: access. Then, it will discuss low-income students' communities, explaining why parents' background influences their children's outcome from digital learning resources. Lastly, the paper will evaluate the self-regulation and motivation of children. Ultimately, all factors discussed are directly or indirectly related to wealth.

2. Access to Online Learning Materials

First-level digital inequality is defined as the disparity between physical materials that are necessary or useful for the ease of access to online learning. For instance, the prerequisites to using digital learning resources are the Internet, electronic devices, and a conducive learning environment. The first two can easily be viewed through Bourdieu's theory of capital as economic capital; students from the ends of the wealth spectrum have vastly different amounts of assets that are integral to learning.

Online education varies with its nuance of application. Everyday use mostly occurs in students' homes, meaning that the Internet and a device – preferably a computer – are necessary tools for practical usage of technology. Due to the pandemic, Internet access at home for 3- to 18-year-old students in America has increased compared to years before [10]. This is not to say that there is no socioeconomic inequality in students' access to computers and the Internet; instead, studies show that inequality in digital setup in America has been reduced compared to pre-pandemic times. Specifically, numerous American programs in various socio-economically disadvantaged neighborhoods provided wider access to computers or home internet access. For instance, 68 percent of adults whose household incomes were below \$25,000 were provided with computers by their schools [10]. In addition to the boost from the pandemic, standard efforts have been prevalent in the proliferation of internet access, meaning fundamental access to e-learning is growing as society advances into the decade [11].

Many technological developments in personalized online learning techniques allow numerous more disadvantaged students to use the Internet purposefully, especially in a manner that supplements traditional face-to-face schooling. To demonstrate, most online learning platforms – such as Khan Academy, founded in 2008 – require 1.5 Mbps bandwidth per student and only 150 kbps if the student focuses exclusively on exercises [12]. Additionally, Khan Academy allows downloading videos that make them available to watch offline. In 2019, 99 percent of American K-12 schools had access to high-speed Internet, and in 2022 that figure increased [13]. Therefore, in a post-pandemic America, the vast majority of enrolled students, whether economically disadvantaged or not, can technically access resources via school-provided Internet or at home, albeit with varying degrees of convenience. Again, it is paramount to emphasize the massive strides in developing the 22-year-old e-learning market. In decades before, students without the means of enrolling in expensive extracurricular programs and hiring personalized tutors resorted to school-provided material, often of low quality, as schools in poor zones received inadequate funding [14]. With the expansion of the e-learning industry, more materials are within reach for many students in the lower class. For instance, in 2015, Khan Academy partnered with College Board to provide free and personalized online practice in Official SAT Practice. Reportedly, this digital tool has been of service to more than 10 million students since its launch [15]. The Official SAT Practice is an example of a free alternative to costly classes resulting from the recent development in digital learning technologies. In the past two decades, whether humanities or STEM and whether K or 12, courses have all received additional and attainable resources in the form of online platforms, websites, classes, lectures, books, songs, and even educational games.

Thus, thanks to the wave of digitalization, more of the United States is within reach of the Internet compared to previous decades. The subsequent trend of digital learning resources has brought about unprecedented convenience for lower-class students.

Past studies and data point out that limitations still blockade poorer demographics from accessing the Internet in a meaningful manner. Articles particularly focus on the digital divide during pure online learning enforced during the height of COVID-19. Only 57% of U.S. adults with income lower than \$30,000 have broadband internet access [16]. One survey reveals that 56 percent of lower-income families with 3-year-old to 13-year-old students have slow internet connections and 59 percent have poor-quality computers [17]. Notably, this paper acknowledges the previous research that underscored the digital inequality – which resulted from lockdowns suddenly forcing students to learn entirely online – and the persistent divides in practical means of Internet access.

Still, researchers have overly focused on the electronic setup and often turned a blind eye to more other considerations. Excluding the electronics, the physical facility of a student's home affects their academic achievement and, thereby, their usage of digital learning resources. Parts of the physical facility of the student, such as noise, distractions, and space, drastically vary between the wealth classes.

Poor students are more likely to learn in noisier settings. A study in California shows that 12% of students never have spaces free of noise or distraction, and 25% of students sometimes do not have quiet learning spaces[18]. Only 36% of high school students said they always had a space free of noise or distraction. The low-income or marginalized students are proportionally more the ones with noisy and distracting spaces because it is harder for them to find an adequate study room. Past studies have established a statistically significant and positive correlation between the quality of physical facilities at home and students' academic achievement [19]. Therefore, it is inferable that inadequate physical facilities overwhelmingly hinder poorer students and their learning outcomes from digital learning resources. On the other hand, middle-income or wealthy students maximize their learning from online resources when they have a quiet, spacious, and distraction-free room.

3. The Community: Impacts on the Habits of Using Digital Resources

Through the lens of classical Behavioral learning theory, all behavior, including actions concerning the usage of digital learning resources, results from the surrounding environmental reinforcement [20]. Therefore, the atmosphere of the community around students influences their habits of using digital resources.

First, parents in low-income families are less available and involved in their children's affairs, resulting in a weak reinforcement of the virtues of digital learning among their children. Parents who struggle with monetary challenges such as employment, food, security, and shelters have less capacity to monitor their children's learning. For instance, a questionnaire reports that 32% of parents of school-attending children did not visit the remote-learning sites during the distance learning period. An additional 11% of parents report only having visited the learning sites monthly[18]. An absence of participation from parents results in their children lacking the support necessary, dismissing the efficacy of the online resources, and having a decreasing motivation to supplement their studies with online resources. When poorer parents are proportionately the majority who are not interacting with their children in regards to digital learning resources, their children are the ones who are less likely to pick up digital learning, continue, and get anything out of it.

Parents' digital and educational literacy affects their children's digital literacy, ultimately influencing the efficacy and appeal of digital learning resources. Namely, studies have shown how children's internet use frequency was predicted by their parents' frequency of using the Internet [21]. Low-income parents used the Internet less frequently on average, causing their children to use it less frequently. The phenomenon of children acting similarly to their parents can be interpreted through

modeling theory. Modeling theory explains that individuals behaviorally learn from others by observing their actions and the resulting consequences. Studies have shown that parents influence their children's learning aspirations through their own habits with learning resources [22]. Therefore, the same is transferrable to digital learning resources: when low-income parents often refrain from digital learning resources or use the Internet for entertainment, their children will imitate. Reports conclude that the online activities of parents can directly predict their children's online activities [21]. Specifically, the frequency discrepancy is corroborated by Pew, which reported that teenagers were the least likely to use the Internet in the lowest-income families; Internet use rose with income [23]. Because Internet frequency is a crucial indicator of digital literacy and the skillset in using digital learning resources, such as navigating websites and dealing with connectivity issues, children in low-income families have lower digital literacy due to their inexperienced parents. Inexperience with the Internet could also lead parents to implement misinformed rules and regulations regarding the Internet to their children, such as restricting their children's time online[21]. In other words, lower digital literacy among poor students and parents' actions disincentivize low-income students' usage of online learning resources; using the online resources requires more time and effort for poor students, making it a frustrating endeavor.

Additionally, a family's income significantly correlates with the education completion level of the parents of the family [24]. The educational literacy of parents affects the amount of support children can receive when navigating educational websites, especially if English is not the parent's first language.

4. The Individual

First, a synthesis of the conflicting theories of constructivist learning and sociologist Bourdieu illustrates the complex caveats of generalizing the motivation of any individual, not mentioning an entire demographic group. Still, by seeing personalized learning resources through the lens of motivation theory, self-regulated learning theory, and domestication theory, the disparities between the online activities of students of varying economic classes can be explained.

In the social cognitive view, self-regulated learning is the ability of students to control themselves academically [25]. By many papers, self-regulation has been proven to be a significant factor that positively influences a student's "academic skillset" and, thereby, his or her inclination to use digital learning resources [26].

Domestication theory reasons that all manifestations of self-regulation stem from the surrounding environmental background of the individual. Seeking the start of this causation chain yields the household education background, that is, the average income and education level of the entire family, which are often interconnected.

Educational Attainment of Householder¹

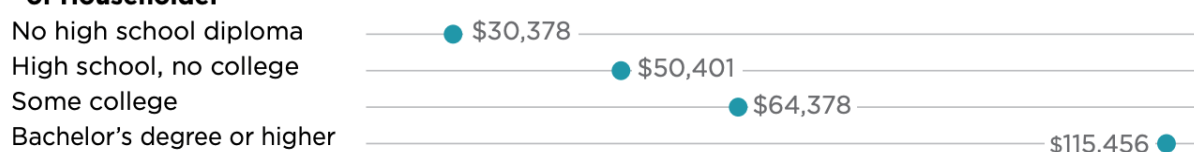


Figure 1: Median Household Income and Percent Change by Selected Characteristics [27]

Figure 1 above from the United States Census Bureau illustrates the class education disparity. In 2021, households with average median income of \$30,378 were likely to have a householder with no

high school diploma. In contrast, households with median income of \$115,456 were almost guaranteed to have a Bachelor's degree or higher.

Evidence verifies that households with lower educational attainment are more likely to use platforms on the Internet that are less "capital-enhancing" [28]. For instance, wealthier households with parents that have higher educational attainment are more likely to read the news, use the Internet for work, or arrange for travelling. In contrast, lower-income households are more likely to use social media for messaging or listening to music [28]. This type of environmental habit – also referred to as "habitus" by Bourdieu – eventually trickles down to the children in the household, influencing their behavior and the likelihood that they use the Internet for academic purposes, as per modeling theory. Modeling theory explains that individuals act in accordance with the actions and consequences of others whom they look up to. Evidently, in a study, children with more privileged backgrounds with more educated parents were found to have a higher chance of viewing educational programming on their electronic devices when compared to less well-off children [28]. As children grow up and develop social cognitive skills such as self-regulation, the discrepancies between privileged and unprivileged children explain why students use the Internet differently. Moreover, other research has suggested that students' prior academic achievement and preparation influence their exhibition of self-regulated learning[9]. Students who have performed poorly in the past exhibit worse performance in the present and future. In other words, self-regulated learning, vital to using digital learning resources, carries down from parents and continues throughout a student's lifetime. Lower-income families have householders with less educational attainment, and their background negatively influences the potency of digital learning resources on their children.

Intrinsic motivation is explained as a strong impetus for consistent engagement. When a student becomes reliably passionate about an academic subject, they are explained to be driven by a pure desire to learn more. Various outlets of digital education have been able to foster intrinsic motivation in students. However, much of the motivation to use digital learning resources – supplemental resources outside of school – is arguably derived from the attitude that started with the face-to-face school environment. Unfortunately, the feeling of acceptance and joy in studying for students is heavily associated with their social-cognitive learning in the classroom [29]. Thus, academically challenged students, who are proportionately more likely to be students from low socioeconomic families due to the established inequality in the education system, have less intrinsic motivation to study. These students who perform poorly are overshadowed by their prior disappointment in education, which makes them less likely to engage with digital learning resources. A report from the Rossier School of Education finds that 62 percent of high schoolers responded that a lack of motivation was a significant barrier to completing schoolwork during full online learning. In addition, economically worse-off families tend to live in districts that have less tax money to fund schools, resulting in poorly funded teachers who are inadequate and fail to foster the spark of learning within students. Unmotivated students do not go out of their way to find supplemental resources online.

However, others argue that the innovative digital pedagogical agents used in digital learning resources – such as the virtual bird named Duo in Duolingo – motivate low-income students to learn online. In some rare cases, personalized learning infused with engaging elements has the power to inspire low-income students to study.

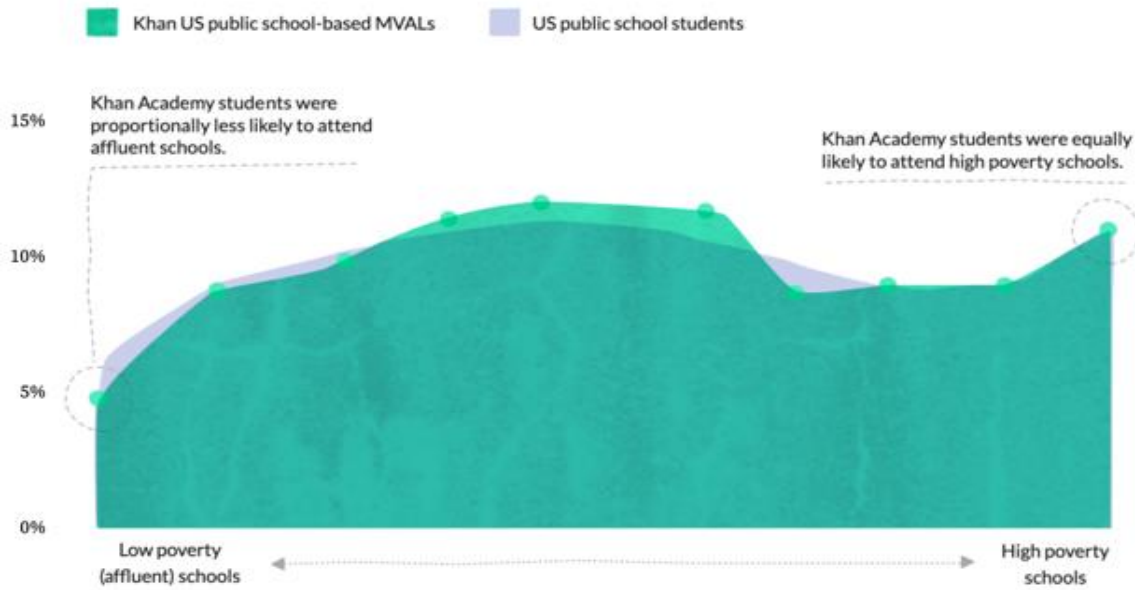


Figure 2: U.S. public school students by school income level [30]

The above graph maps the spread of Khan Academy students with the overall U.S. public school population by school income level. This report in 2018 claims that the monthly very active learners on Khan Academy – those who used at least 120 minutes of Khan Academy per month – were proportionately as likely to attend high-poverty schools. On the converse, Khan Academy students were less proportionately likely to attend affluent schools. Thus, the higher share of active learners who attend high-poverty schools compared to affluent schools indicates that Khan Academy effectively and consistently engages students from low-income backgrounds.

The cognitive theory of multimedia learning explains Khan Academy's large proportion of low-income students. Personalization, such as a friendly teacher using conversational language, increases interest among learners [31]. It results in a deeper level of active cognitive learning and motivation to return to the resource.

In contrast, online platforms with less personalized learning and pedagogical agents – such as animations – attract fewer low-income or poor-background learners. One such platform is Coursera which has over 92 million registered learners. The massive open online courses offered use minimal pedagogical agents and have little to no conversational language. Most courses are recordings of professors. One study by Shrader found that participants with Masters or PhDs were twice as likely to be the ones who watched most of the recorded lectures and earned a high percentage of quiz points compared to participants with only high school degrees or less.

Bernstein's theory of Language Codes explains the discrepancy in low-income student participation between various online learning platforms. Basil Bernstein argued that language differences influence interactions in the educational system. He claimed that lower-class students perform poorly due to their restricted language codes, as opposed to the elaborate language codes that teachers and wealthier students share [32]. To further demonstrate the language barrier, the same study about Coursera found that some participants signed up to improve their English ability, implying that they had trouble understanding more advanced English courses.

5. Conclusion

During the pandemic, low socioeconomic status students were disadvantaged by their lack of preparation. Since then, there has been better integration of education and technology, heightening the chances of educational equality. Nevertheless, after a thorough review of recent studies and national statistics, this paper observes that education inequality persists after the pandemic. For one, a handful of low-income students continue to be denied both prerequisite and convenient access to digital learning resources; strong disincentives, including poor Internet connection or loud environment, dissuade the usage of digital learning resources. Furthermore, the author concludes that digital inequality transcends the physical realm. As suggested by theories and verified by evidence, the surrounding environment of a student has a significant causal effect on his or her study habits and, thereby, the usage of digital learning resources. Parents' availability, involvement, and digital literacy are positively related to household income. Lastly, the self-regulation and motivation of students are likewise related to household income and school quality. While this paper considers the power of new digital pedagogical agents, it finds a knowledge gap in the realm of analysis regarding innovative learning technology. Due to difficulty in measurement, most scholars need more nuanced and robust analysis of how new agents used in online learning may affect students' motivation. Variables such as multimedia, personalization, and animated characters need to be considered in future studies regarding the effectiveness of state-of-the-art online platforms on low-income students. However, by examining the limited number of existing studies, the author finds that most advanced online learning lacks the attractiveness to overcome the obstacles described before. In other words, digital resources are improving in their appeal. However, from the current evidence, their level of captivity is insufficient to overcome an educational inequality that has been entrenched for centuries.

Three areas discussed in this paper could be improved to better help future students born into low-income families. First, society could present the lower class with the physical assets necessary for learning. Second, low-income parents can continue to strive for more education and involvement with their children's education. Lastly, the development of enchanting digital learning resources by innovative scientists could counteract the aforementioned discrepancy in motivation. When digital learning resources become more accessible than a breath of fresh air, more captivating than a videogame, and more informing than a textbook, then – and only then – society has successfully shattered the century-long sociological disparity once and for all.

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