Confronting Misinformation in the Civics Classroom

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The COVID-19 pandemic prompted a radical technological transformation of American education that has had an indelible, encompassing impact on the lives of teachers and students. The pace at which digital tools were adopted and became integral to civic education was greatly accelerated. Educators and their students could explore new frontiers in digital learning (NCSS, 2022a). Teachers raced to acquire appropriate digital tools, understand their pedagogical applications, and embed them meaningfully into the curriculum. Digital tools offer myriad benefits for civic educators and students when they are used creatively and responsibly. They can support active and experiential learning, promote critical media literacy, and enable students to acquire skills for democratic engagement. At the same time, there have been unintended consequences of the abrupt shift to the virtual classroom that could persist in the long-term. Teachers struggle to keep students on topic as they have become more proficient at dividing their attention among different digital stimuli. Students' interpersonal skills, social and emotional learning (SEL), and levels of physical activity have been compromised (Passanisi and Peters, 2022). Serious concerns about equity and privacy in digital learning environments have been raised (NCSS, 2022b; Office of Educational Technology, 2021).

Elementary and secondary school civics, social studies, and American government teachers routinely confront misinformation in their classrooms from a range of sources (Breakstone, Smith, and Wineburg, 2022). This situation was exacerbated during the pandemic as the political climate became inordinately toxic and polarized (Kubin and von Sikorski, 2021). The proliferation of falsehoods, fabrications, half-truths, and distortions that permeate media and society spread rapidly, efficiently, and widely through digital platforms and social networks. The rise in the use of digital tools in civics classes during the pandemic coincided with an increase in the amount of misinformation teachers regularly encountered. While facilitating broad access to content and discussion is a major benefit of digital tools, they also can open gateways to misinformation. Teachers have less ability to control access to the information that students receive through digital channels than is the case with traditional materials, such as paper textbooks and handouts. This study examines whether there is a connection between pedagogies that employ digital tools and teachers' experience with misinformation in elementary and secondary school classrooms. The core research questions addressed are: Is the amount of misinformation teachers encounter in the classroom associated with their use of digital tools for instruction? And are differences in how much misinformation teachers encounter related to the types of digital tools they use?

This study employs data from an original survey of civics teachers that addresses misinformation in the classroom conducted by the Civic Education Research Lab (CERL) at Georgetown University in November of 2021. It builds upon prior research employing this survey data that found significant differences in teachers' perspectives on misinformation based on their personal, professional, and school characteristics. Most teachers consider misinformation to be a major problem in society and the classroom. Many feel a strong sense of responsibility to educate students about misinformation and adopt instructional strategies to counter the problem. They regularly use online resources and digital tools to educate students about misinformation. While teachers readily counter misinformation from news stories, they are more reluctant to correct falsehoods from social media and students (Owen, et al., 2022). The findings here implicate current-day digital tools in introducing misinformation into the civics classroom and creating significant new challenges for civic educators.

Digital Learning Tools for Civics Instruction

In this study, digital learning tools are broadly defined as any learning aids used by educators and students that employ digital technology. Digital tools offer unique prospects for enriching civic learning. They potentially can open learning opportunities for all students (Trust, 2018), although inequities in access to quality civics materials due to gaps in access have been well-documented (van de Werfhorst, Kessenich, and Geven, 2022; Ozturk, 2021; Goudeau, et al., 2021). Digital technology can make teaching more compelling, improve learning efficiency, and create a classroom atmosphere that sustains students' interest. Students can become more fully immersed in the learning process through digital tools than the use of traditional materials. They can access, interact with, and communicate about a vast array of content. Digital tools can redefine learning by "enabling the creation of previously inconceivable tasks" (Trust, 2018: 54). They can embrace a broader range of learning goals and modes of participation that are enabled through technology. Educating while entertaining can be achieved through tools, such as digital games (Raphael, et al., 2009). Digital tools are conducive to student-centered learning. They allow students to be proactive in their educational experience and to engage in co-learning by connecting with each other's work. Teachers have greater flexibility in customizing the curriculum to meet individual students' needs (Office of Educational Technology, 2021). They can create learning landscapes by mixing pedagogies and digital tools that can be customized for each student (Haleem, 2022). The use of digital tools in the classroom can prepare students for active engagement in civic life (Kahne, Hodgin, and Eidman-Aadahl, 2016; Bowyer and Kahne, 2020). In addition to civic content knowledge, dispositions, and skills, students can acquire SEL competencies conducive to good citizenship, such as collaboration and problem-solving. On a macro level, digital tools in civics classes can prepare students for life in a digital-dominant world. Learning can continue outside of the classroom when students are using digital tools that are central to their daily lives. Students can learn to adapt to changes in technology that are often sudden and unpredictable (Haleem, 2022).

The use of digital tools for instruction increased during the COVID-19 pandemic out of necessity (Ozturk, 2021). As the pandemic forced the closing of many schools to in-person learning, reliance on technology to facilitate virtual instruction occurred almost overnight. The situation has been characterized as "a forced experiment to see if online learning worked" (Passanisi and Peters, 2022: online). From March of 2020 through the fall semester, 77% of public elementary and secondary schools moved to online learning. About half of American students had returned to in-person instruction in the spring of 2021, with intermittent periods of increased virtual instruction corresponding to spikes in COVID cases. While 98% of public schools planned to provide full-time, in-person learning in the fall of 2021, some classes remained virtual, and others adopted a hybrid format (IES, 2022). This study was fielded in November of 2021, a challenging semester for teachers and students who regularly faced uncertainty about the instructional environment for their classes. In our study, one-third of teachers were fully in-person during the fall semester of 2021, one-third were virtual for at least half of the semester, and one-third were virtual for less than half of the semester.

Students' use of digital tools for accessing content, communication, and collaboration was enhanced during the pandemic and has become institutionalized (Haleem, 2022). Zoom and other digital conference platforms have become a mainstay of the educational ecosystem.

Teachers came to rely on instructional apps, digital games, artificial intelligence (AI) learning tools, and virtual reality (VR) to augment the curriculum and keep students' attention. Digital tools have been integrated into the civics curriculum to foster students' acquisition of digital citizenship skills. People increasingly connect with government and politics through technological intermediaries. Digital media have afforded young people greater opportunities for taking part in politics. Civics, social studies, and American government classes have become sites for conveying legal, responsible, ethical, and effective use of technology for political engagement (Ribble and Bailey, 2007; Ozturk, 2021; Bowyer and Kahne, 2020). To fully engage in participatory politics that combines online engagement with offline action involves the use of digital tools that heretofore have remained largely outside of the educational setting, such as social media (Kahne, Hodgin, and Eidman-Aadahl, 2016).

The technological demands imposed upon teachers and students during the pandemic by necessity and design have created pedagogical opportunities and challenges. Prior to the pandemic, educators had, as Marc Prensky observed, "slid into the twenty-first century—and into the digital age—still doing a great many things the old way" (Lipscomb, Guenther, and McLeod, 2007: 120). The integration of digital citizenship competencies into the civics curriculum had not kept pace with societal trends (Owen, 2016; Owen, 2017). The need to conduct classes virtually forced teachers to engage quickly in pedagogical innovation with digital tools. Novel approaches to teaching and learning were developed that have transformed established educational practices. Much of this innovation occurred on the fly, without attention to how these new teaching profiles were radically shifting pedagogies and changing the relationship between teachers and students.

Types of Digital Tools

Abundant digital tools are available to teachers, and the options are ever-increasing. Five general types of digital tools used in civics classes were examined in this study—tools that convey content, interactive learning apps, tools for learning through experience, tools for sharing and interaction, and communication tools. The tools were categorized by the basic functions they provide for educators. Some tools perform functions that fit with more than one category and were placed in the group that is most consistent with their prominent classroom use.

Digital tools that convey content make a wide range of material available to students in various formats, such as news sites, videos, audio streaming, and podcasts. The material can supplement curricular goals by highlighting current events, bringing historical events and civic experiences to life, providing backstories on topics covered in textbooks, keeping students updated on civic affairs in real time, and helping them to understand political processes (Lipscomb, Guenther, and McLeod, 2007; Hall, 2020). Content conveyed to students digitally has greatly supplanted traditional hard copy materials distributed on paper.

Interactive learning apps, as defined here, are platforms that support a range of options for interactive instruction. Nearpod, Padlet, and similar platforms allow teachers to create lessons that incorporate interactive slides, simulations, active video experiences, activities, and games. Teachers and students can access interactive materials from sources, like iCivics, the Center for Civic Education, and the Bill of Rights Institute, and integrate them into the learning experience.

Kahoot! is a platform that allows teachers to create learning games and share them with their classes and other players. Digital games can enhance political interest among disengaged and lower performing students and advance civic equity (Bachen, et al., 2015). These apps make it possible for students to interact with content and post their ideas and reactions in real time. They enable collaborative learning while reducing teacher effort. They can interface with a range of technologies and other platforms for ease of use, and typically have built-in security features (Naik, Kathavate, and Metagar, 2022).

AI learning tools and VR apps are categorized as tools for learning through experience. AI tools are capable of producing responses to teachers' and students' inquiries in natural language, computer code, images, and other media. They have been used by educators to help students improve their writing and comprehension skills (Stanford University, 2023). Civics teachers employ AI to have students hone their critical thinking abilities, evaluate the quality and accuracy of sources, and assess evidence. AI has been used to transcribe historical documents and summarize the main points of texts. Teachers of English learners use AI for translation (Berson and Berson, 2023). It should be noted that the present study was conducted before ChatGPT and similar AI applications were a factor in education. VR is a simulated experience that allows people to interact directly with an image or environment. It has been used for field trips that transport students to places in time and space where they can become active participants (Gunn, 2023). *The New York Times* has made VR experiences available to educators since 2015, with lessons that place students at key junctures in history, such as the civil rights movement (Feldler and Proulx, 2021).

The category of digital tools for sharing and interaction encompasses instructional platforms, message boards, and social media. Instructional platforms, such as Google Classroom and Blackboard, provide teachers with virtual mechanisms for creating, sharing, and distributing content to students, communicating about assignments, facilitating content creations, and preparing digital portfolios. While these functions also can be managed by interactive learning apps, a feature of digital instruction platforms is their frequent use by teachers to have students share their work and ideas, generate discussion, and connect with other students, experts, and policymakers outside of the school (Oktaria and Rahmayadevi, 2021). Incorporating social media, such as Facebook, X (formerly Twitter), TikTok, and blog sites, into the civics classroom is a contested issue. Proponents argue that social media are an integral aspect of political life that should be integrated into civic education so that students can be taught to use them responsibly and learn how to critically evaluate messages. The platforms are familiar to teachers and students, are easy to use, and can readily be adapted to host interactive discussions (van den Beemt, Thurlings, and Willems, 2020). Still, moving students from social engagement to civic engagement on social media platforms can be a daunting task for educators, especially keeping students on task (NCSS, 2018). Privacy issues and the loss of control over the content that students produce and to which they are exposed are major challenges (Anderson, 2019).

The use of communication tools, like online meetings, video calls, and Zoom, remains vital even as their role has been transitioning in the post-COVID environment. Teachers who acquired new digital communication skills continue to rely on these tools while instructing in-person (Dunn, 2021). The use of communication tools has prompted some educators to reimagine how education can be delivered and customized to better meet the needs of individual

students, some of whom thrived in the online environment (Abramson, 2021). These tools are being integrated into novel instructional approaches designed to improve communication between teachers and students by diversifying the way the content is delivered (Lockee, 2021).

Misinformation in the Civics Classroom

The connection between the use of digital pedagogies and the problem of misinformation in the civics classroom has received little attention. Studies have addressed issues of privacy and exposing students to unsafe content through digital tools (NCSS 2022b; Ozturk, 2021; Haleem, 2022, Chang, 2021). Other research trajectories have focused on ways that teachers can gain education technology competencies to combat misinformation when it is encountered in the classroom (Beeson, Journell, and Ayers, 2014; Manfra and Holmes, 2020), including by using digital tools designed for that purpose (Owen, et al., 2022). The present research examines empirically whether the use of digital tools has consequences for introducing misinformation into civics classes, a topic that has received scant attention.

It is well-established that digital platforms, including those used in schools, host and proliferate misinformation in increasingly sophisticated ways (Kubin and von Sikorski, 2021). A potential risk of the enhanced use of digital tools is the introduction of greater misinformation from more sources into the education context (Kahne, Hodgin, and Eidman-Aadahl, 2016). The general definition of misinformation used in this study is information circulated in the news, on social media, and on digital platforms that is false, inaccurate, or misleading (Thagard, 2021). Some scholars have distinguished between the related concepts of misinformation and disinformation based on the question of intent (Guess and Lyons, 2020). Misinformation is associated with misleading facts or inaccurate information that is spread inadvertently without the intent to harm (Gabarron, Oyeyemi, and Wyn, 2021). It can include pseudoscience and conspiracy theories (Altay, et al., 2023). Disinformation has been defined as content that is deliberately fabricated, manipulated, or biased with the intention of promoting propaganda, rumors, or conspiracy theories (Cooke, 2018). While acknowledging the utility of parsing these differences, establishing the intent of the source of information can be difficult (Guess and Lyons, 2020). Misinformation, as the concept is delimited in this study, can be any type of incorrect or false information regardless of the intention to mislead or harm. This basic definition allows for broad consideration of all manner of false or misleading information by the teachers participating in our study.

There are many ways for misinformation to enter the civics classroom. Social media and other digital communication platforms worsen the problem of misinformation (Altay, et al., 2023). They readily disseminate content across billions of accounts with little third-party filtering, fact checking, or editorial judgement (Bucy and Newhagen, 2019). Students routinely comes across fake news stories, false claims, conspiracy theories, hoaxes, and manipulated images and videos when they use social media and message boards even when they are accessing them in class (Schwartz, 2020). They encounter misinformation when perusing news stories online where it is increasingly difficult to distinguish a trusted source from an imposter. Even established news outlets are complicit in the proliferation of dubious information. Politicians and pundits regularly disseminate misinformation on cable news which is broadly amplified on social media (Molina, Sundar, and Le, 2021). Professional fact-checkers and journalists, let alone

teachers, have a difficult time keeping pace with and debunking the flood of false stories. Students can amplify misinformation they glean from news stories, blogs, and their preferred social media of TikTok, YouTube, Instagram, and Snapchat in conversations they have with classmates. They can repeat unreliable or distorted statements from family members and adults. In fact, passive sharing of this sort, rather than intentional distribution, is a more prevalent way for misinformation to be spread in schools (Duardo, 2021). AI has been deployed to rapidly advance misinformation by manufacturing stories and posts that appear to be first-person accounts (Villasensor, 2020). In this study, we focus on misinformation that emanates from news stories and current events, social media, and students themselves.

The deluge of readily accessible information is difficult for students to sort through with a critical eye. Students frequently are unable to distinguish between good and bad information. According to a RAND Corporation study, nearly 90% of secondary school teachers felt that students' inability to evaluate credible online information was a problem (Hamilton, Kaufman, and Hu, 2020). Students are largely unaware of the ways that information is manipulated and misrepresented by sources whose background and motives they rarely question (Butrymowicz and Salman, 2021). A study by the Stanford Graduate School of Education concluded that young people's ability to judge the veracity of online information using reasoning skills was "bleak" (Wineburg, et al., 2016: 4). Despite being "digital natives" adept at the use of social media, few students in the study were savvy about the information posted online. Significant numbers of middle school, high school, and college students could not adequately judge the credibility of claims. They were unable to differentiate between news and opinion, distinguish a news story from an ad, or identify the source of a legitimate news site from an imposter site (Wineburg, et al., 2016).

Hypotheses

Current societal and political trends have created conditions conducive to the massive proliferation of misinformation, much of which is disseminated through virtual channels. The open boundaries intrinsic to much digital technology make it difficult to contain misinformation from making its way into civics classes. I argue that the ubiquitous encounters with misinformation in the civics classroom are, in part, the unintended consequence of the widespread use of digital tools. Thus, the following hypothesis was tested:

> H_1: The greater teachers' use of digital tools in the classroom, the more likely they are to encounter misinformation.

Not all digital tools have the same capacity to deliver misinformation to classrooms. Certain types of digital tools provide more opportunities for misinformation to be accessed, shared, and created. Platforms differ in the degree to which their content boundaries and controls over information are fluid. In some cases, teachers may not have sufficient technological skills to manage settings that would allow them greater oversight of what their students are reading, hearing, and viewing. Tools for sharing and interactivity and those used to convey content are inherently more conducive to the unfettered flow of misinformation. Some platforms offer teachers greater capacity to specify and manage their classroom information environment. Teachers can facilitate the discourse and content sharing that occurs via digital communication

tools. Interactive learning apps are often populated by lesson plans, activities, and digital resources assembled by the provider or respected civic education organizations. These apps afford teachers a measure of control over the content students receive. The same was true for experiential tools in the fall of 2021 when this study was fielded. AI tools were integrated into platforms that performed specific tasks, such as correcting students' written work and translating materials. VR tools were used to provide students with simulated experiences related to historical events and civic life. A corollary to the first hypothesis was tested:

> H_2: The amount of misinformation that teachers encounter in their classrooms is related to the type of digital tools they regularly employ for instruction.

Data

This study employs data from an original survey of elementary, middle, and high school teachers that was conducted by the author and graduate students in Georgetown University's Communication, Culture, and Technology (CCT) program under the auspices of the Civic Education Research Lab (https://cerl.georgetown.edu/). The survey examined teachers' use of digital and conventional tools in civic education classrooms, their grasp of these tools, and how the technology affects their classroom teaching practices. It was administered online to civics, social studies, American government, and history teachers recruited from the network of the Center for Civic Education (https://www.civiced.org/). The study was in the field from November 8-28, 2021, during the COVID-19 pandemic. A total of 390 teachers who completed the survey were included in the analysis, consisting of 175 high school teachers, 104 middle school teachers, and 111 elementary school teachers.

Measures

The survey included batteries of items that dealt with the digital tools teachers used and pedagogies, such as lecture and discussion, where they incorporated these tools. Measures assessed how much of an issue misinformation was to teachers and the extent to which they encountered misinformation in their classrooms. Several variables related to the schools and instructional contexts were used in the analysis.

Misinformation

Survey respondents were provided with the definition of misinformation described above prior to answering a battery of questions about the concept: "We define misinformation as information circulated in the news, on social media, and on digital platforms that is false, inaccurate, or misleading." The objective was to provide teachers with a clear, broad definition of misinformation that they could readily apply while responding to the survey items. The survey contained a battery of items about teachers' perceptions of misinformation as a problem in society and the classroom and their encounters with misinformation from news stories and current events, social media, and students.

Respondents were asked how much of a problem misinformation is in society and in the classroom (1 not much of a problem, 2 somewhat of a problem, 3 a major problem). They also indicated how much they felt digital technology has contributed to the increase in

misinformation (1 not much, 2 some, 3 a great deal). Respondents reported how often they encountered misinformation in their classes from news stories and current events, social media, and students (1 rarely or never, 2 some classes, 3 most classes, 4 every class). An additive Misinformation Index was created that combined the variables measuring teachers' exposure to misinformation from the three sources. The Misinformation Index ranged from 1 to 10 and had a reliability (Cronbach's α) of .688.

Digital Tools

Teachers indicated how often they used digital tools in conjunction with specific learning approaches, including lecture, discussion, individual student classwork and assignments, group classwork and assignments, and student-centered learning. They also were asked how often they used specific types of digital tools in the classroom. Tools whose primary function is to convey content were videos, online videos/YouTube, audio content, podcasts, and online museums. Teachers' use of interactive apps in general as well as Kahoot!, Padlet, Nearpod, and digital games were included on the survey. Digital tools for learning through experience were AI learning tools and VR. Tools that facilitate sharing and interaction were digital message boards, social media, and Google Classroom/Canvas/Clever/Blackboard. Communication tools were online meetings/video chat, video calls, and Zoom. The response options for all items were 1 rarely or never, 2 some classes, 3 most classes, and 4 every class. The variables in each of the digital tools categories were combined to form additive indexes. The Content Index ranged from 1 to 14, the Apps Index from 1 to 16, the Experience Index from 1 to 7, the Sharing Index from 1 to 10, and the Communication Index from 1 to 9. A Total Tools Index combined all eighteen digital tools variables and ranged from 1 to 49. The reliability (Cronbach's α) for all of the indexes was acceptable except for the Sharing Index. (See Table 1.)

Table 1
Digital Tools Indexes Reliability
Cronbach's α

Index	Cronbach's α
Content Index	.678
Apps Index	.784
Experience Index	.795
Sharing Index	.317
Communication Index	.599
Total Tools Index	.868

Control Variables

Control variables for Title I schools, a schools' regional location, and the mode of instruction (in-person, virtual, hybrid) teachers used during the fall semester of 2021 were entered into the model examining the relationship between teachers' use of digital tools and misinformation. The Title I school variable (1 Title I school, 0 not Title I) indicated if a school got federal funding because it served a high percentage of students who receive free or reduced cost meals. The survey employed a national sample with teachers from across the country. The region of the country—Northeast, Midwest, South, and West—where the teacher was situated

was included in the analysis. Research has demonstrated that the U.S. has distinct political cultures that are geographically defined. Urban-rural political divides are accentuated in different parts of the country and are tied to differences in core political orientations (Gimpel, et al., 2020). Perceptions about misinformation are related to partisan affinities and the news diets of people in particular parts of the country (Mitchell, et al., 2021). It may be the case that teachers in certain regions of the country perceive that they are encountering misinformation in their classrooms more often than those in other areas. Dummy variables for Northeast, Midwest, and South were entered into the multivariate equations, with West as the reference category. Finally, the mode of instruction—in-person, virtual, and hybrid—was included in the analysis. In-person teachers were fully in-person for the entire semester, virtual teachers instructed their classes online for half of the semester or more, and hybrid teachers were virtual for less than half of the semester. Hybrid teachers were the reference category in the multivariate analyses.

Perceptions of Misinformation

Most of the teachers in the study considered misinformation to be a problem, which is consistent with the views of the general population (Pearson Institute, 2021). However, they perceived misinformation to be a more serious issue in society than in their classrooms. 95% of teachers considered misinformation to be a societal problem, with 56% indicating it was a major problem. In contrast, 97% of respondents considered misinformation to be an issue in their classrooms, with 36% reporting that it was a major issue. Teachers suggested that digital technology had influenced misinformation, although there was some disagreement about whether the impact was positive or negative. 60% of teachers felt that technology had increased misinformation, while 33% indicated that it had the opposite effect. Seven percent of respondents considered technology to have no effect on misinformation.

Teachers reported how often they encountered misinformation in their classrooms from news stories, social media, and students. (See Table 2.) 71% of teachers encountered misinformation from news stories in every/most classes. One-third contended with misinformation from news stories in every class. Slightly fewer encountered misinformation in every/most classes from social media (67%) and students (65%). Five percent of teachers rarely or never confronted misinformation in their classes. Teachers identified several additional sources of misinformation in their classrooms. Parents were mentioned most frequently. According to one respondent, “Students come into class believing what they hear from home.” Other sources included app technologies, message boards, and public figures.

Table 2
How Often Teachers Encountered Misinformation in the Classroom
Percentages

	News Stories	Social Media	Students
Every Class	33%	28%	27%
Most Classes	38%	39%	38%
Some Classes	25%	28%	30%
Rarely or Never	4%	5%	4%

Digital Tools and Classroom Pedagogy

Digital tools have become omnipresent in the civics classroom, as teachers in the study frequently used digital tools in conjunction with a range of core learning approaches. (See Table 3.) Over one-third of respondents used digital tools in every class—70% in every class or most classes—when lecturing. A quarter employed digital tools in every class to facilitate discussion, individual student work, group work, and student-centered learning. Over 60% used digital tools in these contexts in every/most classes. A slightly smaller percentage used digital tools when engaging in student centered learning than the other pedagogies.

Table 3
Use of Digital Tools with Learning Approaches
Percentages

	Every Class	Most Classes	Some Classes	Rarely/Never
Lecture	36%	34%	27%	3%
Discussion	26%	43%	26%	5%
Individual Student Work	24%	41%	31%	4%
Group Work	23%	42%	29%	7%
Student-Centered Learning	21%	43%	27%	9%

Correlations (Pearson's R) were computed between teachers' integration of digital tools into their classroom pedagogies and confronting misinformation from news stories, social media, and students. The results provide support for the first hypothesis that teachers who integrated digital tools into their classroom instruction frequently were more likely to encounter misinformation. (See Table 4.) The strongest, positive correlation for encountering misinformation from news stories and current events was found for teachers who use digital tools in conjunction with lectures (.267) followed by student-centered learning (.166). These two relationships were statistically significant at $p \leq .01$. The correlation between using digital tools during class discussions and encountering misinformation from news stories (.098) was weak, but statistically significant. Overall, the correspondence between encountering misinformation in the classroom in conjunction with each of the learning approaches was highest for social media. The correlation was strongest for misinformation from social media and using digital tools for student-centered learning (.257), followed by group work (.240), lecture (.217), discussion (.205), and individual student work (.134). All of the coefficients were statistically significant at $p \leq .01$. Encountering misinformation from students was most highly correlated with group work (.185), student-centered learning (.172), and class discussion (.160). The association was positive, yet weak, for individual student work (.097) and lecture (.092). All of the coefficients attained statistical significance. The relationship between use of digital tools and encountering misinformation was weakest for individual student work.

Table 4
Use of Digital Tools with Learning Approaches and Misinformation
Pearson's R

	News Stories and Current Events	Social Media	Students
Learning Approaches			
Lecture	.267[a]	.217[a]	.092[b]
Discussion	.098[b]	.205[a]	.160[a]
Individual Student Work	.081[c]	.134[a]	.097[b]
Group Work	.077	.240[a]	.185[a]
Student-Centered Learning	.166[a]	.257[a]	.172[a]

[a]p≤.01 [b]p≤.05 [c]p≤.10

Use of Digital Tools

Nearly all of the teachers in the study—98%—used digital tools of some type in their civics classes. Digital tools were a constant and pervasive presence at all levels of instruction. Grade-level differences in the frequency of use of digital tools by the teachers in the study were negligible. The exception was a weak, statistically significant finding that elementary school teachers were slightly more likely to use learning apps than middle and high school educators.

In general, teachers used digital tools for conveying content, sharing and interaction, and communication more often than interactive learning applications and tools for learning through experience. (See Table 5.) Of the tools for conveying content, video and audio tools were used most often. These tried-and-true tools were heavily integrated into civics instruction prior to the pandemic. Over 60% of teachers used videos, online videos/YouTube, and audio content in every class or most classes. Podcasts (50%) and online museums (46%) were used less frequently. Nearly 60% of respondents used learning apps in every class or most classes. Between 16% and 17% of teachers used specific apps—Kahoot!, Padlet, and Nearpod—in every class. More teachers used Padlet (52%) than Nearpod (44%) and Kahoot! (37%) in every/most classes. Digital games were used by 19% of teachers in every class and 47% in every/most classes. Tools for learning through experience were used by less than one-fifth of teachers in every class. One-quarter of respondents rarely or never used these tools for instruction. The sharing and interaction tools of digital message boards and Google Classroom, Blackboard, and similar platforms were used in every class by one-third of teachers. Social media were used less frequently, with 21% of respondents integrating those platforms into every class. One-fifth of teachers rarely or never employed social media in class. All teachers used online meetings with their classes at least sometimes. Twenty percent of respondents hosted video calls and 25% used Zoom in every class. Many of these teachers held at least some of their classes virtually during the fall semester of 2021.

Table 5
Use of Digital Tools in the Classroom
Percentages

	Every Class	Most Classes	Some Classes	Rarely/Never
Convey Content				
Videos	28%	41%	31%	--
Online Videos/YouTube	22%	43%	29%	7%
Audio Content	26%	35%	39%	--
Podcasts	16%	34%	33%	17%
Online Museums	17%	29%	34%	20%
Interactive Learning Apps				
Learning Apps	21%	38%	30%	11%
Kahoot!	17%	30%	37%	16%
Padlet	16%	36%	27%	21%
Nearpod	16%	28%	34%	21%
Digital Games	19%	28%	37%	16%
Learning Through Experience				
AI Learning Tools	17%	34%	27%	22%
Virtual Reality	15%	29%	32%	24%
Sharing and Interaction				
Digital Message Boards	34%	34%	31%	1%
Social Media	21%	29%	31%	19%
Google Classroom, etc.	31%	35%	26%	8%
Communication				
Online Meetings	34%	30%	36%	--
Video Calls	20%	37%	29%	14%
Zoom	25%	40%	25%	10%

Digital Tools and Misinformation

Bivariate correlations (Pearson's R) were computed between teachers' use of digital tools in the classroom and the extent to which they encountered misinformation from news stories and current events, social media, and students. The associations were calculated for the indexes as well as each individual tool. The findings lend additional corroboration of the first hypothesis that teachers who are heavy users of digital tools for classroom instruction are more likely to encounter misinformation. (See Table 6.) Overall, the correlations were highest between the use of digital tools and encountering misinformation from news stories and current events followed by social media and students. The association between the Total Tools Index and misinformation was .420 for news stories, .324 for social media, and .230 for students. The coefficients were statistically significant at $p \leq .01$.

The use of digital tools to convey civic content had the strongest correlation with confronting misinformation from news stories. The Pearson's coefficient for the Content Index was (.361) for news stories, (.293) for social media, and (.252) for students. Podcasts (.303), online museums (.317), and online videos, like YouTube (.221) were more closely related to encountering misinformation from news stories than traditional videos (.132) and audio content

(.136). Online videos (.250) and online museums (.221) had the largest correlation coefficients for encountering misinformation via social media, compared to videos (.165), podcasts (.164), and audio content (.118). The findings suggest that long-standing, more basic video and audio tools are less likely to introduce misinformation into the classroom. These tools often host fixed content that teachers can select and manage.

The correlation between the App Index and misinformation from news stories (.363) was large, compared to the coefficients for social media (.258) and students (.196). Moderate associations were found among the individual interactive learning applications and misinformation from news stories for Padlet (.328), Nearpod (.299), digital games (.275), and Kahoot! (.243). The correlations between digital games (.225) and Kahoot! (.219) were the strongest for misinformation from social media followed by Nearpod (.195), and Padlet (.190). The relationship between learning apps generally (.389) and misinformation from students was notably higher than for any of the specific learning app variables. Use of Padlet (.214) and Nearpod (.165) were more closely associated with misinformation from students than digital games (.131) and Kahoot! (.107). These coefficients were all statistically significant.

The use of tools for learning through experience had the greatest association with teachers encountering misinformation from news stories in their classrooms. The correlation of the Experience Index with misinformation from news stories was .377 and reflected the strong associations evident for AI learning tools (.326) and VR (.361). The relationships between the Experience Index and misinformation from social media (.164) and students (.202) were decidedly smaller. Use of AI learning tools had a slightly higher correlation with encountering misinformation from students (.161) than social media (.140). The associations with misinformation from social media (.158) and students (.208) were higher for VR. The Pearson's R correlations were statistically significant at $p \leq .01$ for all variables.

The trend for digital tools for sharing and interaction was somewhat different than for the other categories of tools. The Sharing Index was more highly correlated with confronting misinformation from social media (.394) than from news stories (.351) and students (.209). This result is understandable given that social media platforms are among the digital tools for sharing and interaction. Social media use had the highest correlation with encountering misinformation from news stories (.398), which are often shared on these platforms. The association between the use of social media platforms in the classroom was less robust for misinformation from social media (.275) than for news stories and current events. It is likely that teachers were using social media more often to access news and current events than to have students read comments or post reactions to content. The relationship was weakest for social media use and misinformation from students (.160). Use of classroom management platforms was correlated moderately with misinformation from news stories (.288) and social media (.238), and weakly associated with misinformation from students (.119). Use of digital message boards had the smallest association with encountering misinformation among the sharing and interaction tools variables. The correlation was .184 for news stories, .255 for social media, and .127 for students. All of the relationships were statistically significant at $p \leq .01$.

The association between the Communication Index and misinformation from news stories (.304) was somewhat smaller than for the other digital tool indexes. This finding makes sense, given that this index reflects communication between individuals and groups, and is not directly

related to providing news. Among the specific communication platform variables, video calls (.309) had the strongest association with news stories, followed by Zoom (.216). There was no relationship for online meetings. The communication index was moderately correlated with misinformation from social media (.248). Video calls (.248) had the strongest association with encountering misinformation from social media, compared to Zoom (.164) and online meetings (.131). The Communication Index was correlated moderately with misinformation from students (.230). The largest coefficient among the individual indicators was for video calls (.202). The relationship between online meetings (.114) and Zoom (.111) was similar.

Table 6
Correlations Between Use of Digital Tools in the Classroom and Misinformation
Pearson's R

	News Stories Current Events	Social Media	Students
Convey Content			
Videos	.132[a]	.165[a]	.124[a]
Online Videos/YouTube	.221[a]	.250[a]	.218[a]
Audio Content	.136[a]	.118[a]	.080
Podcasts	.303[a]	.164[a]	.127[a]
Online Museums	.317[a]	.221[a]	.191[a]
Content Index	.361[a]	.293[a]	.252[a]
Interactive Learning Apps			
Learning Apps	.163[a]	.121[a]	.389[a]
Kahoot!	.243[a]	.219[a]	.107[b]
Padlet	.328[a]	.190[a]	.214[a]
Nearpod	.299[a]	.195[a]	.165[a]
Digital Games	.275[a]	.225[a]	.131[a]
Apps Index	.363[a]	.258[a]	.196[a]
Learning Through Experience			
AI Learning Tools	.326[a]	.140[a]	.161[a]
Virtual Reality	.361[a]	.158[a]	.208[a]
Experience Index	.377[a]	.164[a]	.202[a]
Sharing and Interaction			
Digital Message Boards	.184[a]	.255[a]	.127[a]
Social Media	.398[a]	.275[a]	.160[a]
Google Classroom/Blackboard	.288[a]	.238[a]	.119[a]
Sharing Index	.351[a]	.394[a]	.209[a]
Communication			
Online Meetings/Video Chat	.044	.131[a]	.114[b]
Video Calls	.309[a]	.184[a]	.202[a]
Zoom	.216[a]	.164[a]	.111[b]
Communication Index	.304[a]	.248[a]	.230[a]
Tools Index	.420[a]	.324[a]	.258[a]

[a]p≤.01 [b]p≤.05 [c]p≤.10

OLS Regression Analysis

To further explore the relationship between the use of digital tools and encountering misinformation while controlling for potentially confounding factors, multiple OLS regression analyses were performed. The dependent variable in each equation was the Misinformation Index. Separate equations were estimated for the Total Tools Index and each of the five digital tools indexes. Control variables were entered for Title I school, Northeast, Midwest, and South regions (West was the reference category), in-person instruction, and virtual instruction (hybrid instruction was the reference category). Additional controls for public or private school, charter school, religious school, technical school, if a school had one-to-one computing where each student received a digital device, and grade level were entered into the multivariate models. These variables had weak to nonexistent relationships to misinformation, and none were statistically significant, so they were dropped from the models.

The results of the regression analyses support H_1: that teachers who make extensive use of digital tools in their classes on a regular basis are more likely to encounter misinformation from a range of sources. (See Table 7.) The relationship in the model between the Tools Index and the Misinformation Index was strong (beta=.397) and statistically significant at $p \leq .01$. The coefficient for the Tools Index was by far the largest in the equation. Teachers were more likely to encounter misinformation if they worked in a Title I school (beta=.090). Respondents in the Midwest (beta=-.118) and South (beta=-.103) reported encountering misinformation in their classrooms less often than those in the West. These findings were statistically significant. The coefficient for the Northeast region dummy variable (beta=-.050) was small and nonsignificant. Teachers who taught fully in-person (beta=.161) were confronted with misinformation at a somewhat greater frequency than those who instructed their classes virtually for at least half of the semester (beta=.118). Both coefficients were statistically significant.

These trends remained consistent for the regression models incorporating the indexes for the five types of digital tools. The models provide support for H_2: that the type of digital tools used are related to the extent to which teachers encounter misinformation in their classes. The indexes with the strongest relationships to encountering misinformation were for digital tools used for sharing and interaction (beta=.378) followed by tools used for conveying content (beta=.342) and communication (beta=.331). The coefficients for the Apps Index (beta=.309) and the Experience Index (.281) were lower. These findings suggest that teachers who frequently instruct with digital tools that allow for a more open flow of content that they are less able to manage are more likely to encounter misinformation.

The regional control variables in all of the equations exhibit a pattern similar to that in the Tools Index equation. The negative relationships between encountering misinformation and teaching in the Midwest and South regions were slightly more pronounced in the models for the Experience Index, Sharing Index, and Communication Index. The finding that teachers who taught entirely in-person were confronted with misinformation more often than those who instructed their classes virtually was apparent in all of the models with exception of the Sharing Index equation, where the coefficients for in-person instruction (beta=.136) and virtual instruction (beta=.134) were nearly identical. The coefficients for mode of instruction in all equations were statistically significant.

Table 7
OLS Regression Analyses
Misinformation Index on Digital Tools Indexes
beta coefficients

	Tools Index	Content Index	Apps Index
Index	.397[a]	.342[a]	.309[a]
Title I School	.090[b]	.131[a]	.108[b]
Northeast	-.050	-.057	-.051
Midwest	-.118[b]	-.118[b]	-.119[b]
South	-.103[b]	-.089[c]	-.094[c]
In-Person Instruction	.161[a]	.141[a]	.171[a]
Virtual Instruction	.118[b]	.117[b]	.133[a]
Adjusted R^2	.245[a]	.214[a]	.187[a]

	Experience Index	Sharing Index	Communication Index
Index	.281[a]	.378[a]	.331[a]
Title I School	.114[b]	.115[a]	.161[a]
Northeast	-.047	-.047	-.062
Midwest	-.132[a]	-.129[a]	-.131[a]
South	-.101[b]	-.125[a]	-.117[b]
In-Person Instruction	.182[a]	.136[a]	.194[a]
Virtual Instruction	.127[a]	.134[a]	.131[a]
Adjusted R^2	.172[a]	.236[a]	.208[a]

[a]p≤.01 [b]p≤.05 [c]p≤.10

Conclusion

Digital tools have been widely used by elementary and secondary school teachers for decades. Traditional video and audio tools afford educators greater ability to manage the content introduced into their classrooms. The current generation of dynamic, interactive digital tools has been transformative for civic education. These tools can facilitate students' acquisition of civic knowledge, dispositions, skills, and related SEL competencies in new, previously unimaginable ways. They can enable students to reach out to their peers across the world and actively take part in historic events and civic processes virtually. The National Council for the Social Studies (NCSS) recognizes that "social studies educators need to enable youth to have a better understanding of ongoing changes fostered by technology, so as to avoid running the risk of preparing youth for an outmoded form of civic life that no longer exists" (NCSS, 2020: online).

Digital tools for civics instruction are omnipresent in the post-pandemic classroom. They are employed in one way or another in most classes throughout the day. The selection of tools available to teachers is staggering and growing as big tech companies, media organizations, educational app developers, non-profit organizations, and teachers themselves continue to innovate. Over 70% of teachers in the study strongly supported using digital tools in the classroom, while the remainder had mixed feelings. They mostly felt that these tools were helpful to their students and were effective in enabling them to present lessons and materials,

share information, facilitate discussion, keep students engaged, and develop students' critical thinking skills.

At the same time, the implementation of digital tools in the classroom often has occurred haphazardly. The Covid-19 pandemic hastened the process (Haleem, et al., 2022). The unintended consequences of the use of these technologies in education have not been fully explored. As this study demonstrates, the potential for digital tools to bring misinformation into the classroom has accelerated. Specific types of tools, especially those used for sharing and interaction, conveying content, and communication, are more likely to introduce misinformation than interactive learning apps and tools for learning through experience using AI and VR circa 2021. The sudden appearance of ChatGPT in 2022 illustrates how quickly the education technology ecosystem can change. If the study were fielded today, with ChatGPT's potential to offer up faulty information (Strauss, 2023), the findings for AI in the classroom might be different.

The NCSS has advocated for the importance of reimagining the relationship of technology to civic education to reflect the fluid boundaries between students' academic, civic, social, and personal environments. Its recommendations are congruent with the findings of this study.

> . . . the way technology permeated virtually every facet of students' and teachers' academic and personal lives during the global pandemic demonstrates the importance of broadening the focus of instructional technology from a "tools" approach to one with greater curricular emphasis on civic/personal agency and inquiry. Focusing on technology as a set of tools, absent the substance of what students are learning, is like divorcing pedagogy from social studies content and skills. Imagine reducing voting to the mechanics and skills associated with casting a ballot. . . . fostering digital civic participation through critical inquiry, acting in a civic, personal and societal setting is an integral part of students' social studies learning, which requires not simply an understanding of how to use each tool, but also an understanding of the principles embedded in each one, the context in which one plans to use the tool, (in)appropriate ways to use each one, and the implications of doing so (NCSS, 2020b: online).

A comprehensive approach to technology and civic education as advocated by the NCSS is a laudable mission that could help to address the problem of misinformation. Many teachers in the study lamented that misinformation was a substantial problem in their classrooms. They reported taking steps to combat the problem by teaching students to be critical consumers of news and responsible disseminators of digital content. They used curriculum interventions, online resources, and digital tools developed to help students identify false facts and build information literacy (Owen, et al., 2022). However, teachers' ability to meaningfully employ digital tools in the classroom is dependent upon their proficiency in technological pedagogy (Beeson, Journell, and Ayers, 2014). Teachers expressed a need for professional development so that they might adopt best practices for using digital technology in the classroom. Teachers must be able to sort through the abundance of options and find applications that are grade-appropriate and effective. They must have the skills to engage the affordances of digital tools and integrate them authentically and seamlessly into the curriculum. They also must be aware of the pitfalls of

using digital technology and take steps to mitigate them. Teachers might incorporate misinformation encountered through digital tools into lessons where students engage in research and fact-checking. These steps should be pursued within the larger context of technology's role in society.

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