A Virtual Internship to Prepare High School Students for Civic and Political Action

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Abstract
We explored the impact of participating in a Virtual Internship (VI) computer-supported collaborative learning simulation, on high school students’ (n=43) development of knowledge and skills for critiquing the political media with which they engage. Second, we evaluated the effect of this intervention on students’ self-efficacy for using specific media strategies to take political action. Finally, we explored the epistemic (knowledge-seeking) and non-epistemic aims that students set for themselves while participating within our VI, which was designed specifically to address students’ epistemic cognition. Analyses of both the quantitative and qualitative data revealed that students: (1) evinced gains in knowledge about what “fracking” is and also knowledge about why it is a controversial topic; (2) evinced gains in self-efficacy for civic engagement—a key indicator to students’ likelihood for acting; and (3) were able to understand the politicized nature of a social media post, and therefore reported wanting to pursue knowledge-seeking goals to understand both sides of the argument and the trustworthiness of the information sources. We discuss these results vis-à-vis the literature on epistemic games, which can help students develop the knowledge, skills, identity, and values of a profession.

Keywords Epistemic cognition · Self-efficacy · Epistemic games · Democratic education · Civic engagement

We explored changes in high school students’ (n = 43) knowledge about a policy issue (“fracking” in this case) and why the issue is controversial, while they participated in a Virtual Internship (VI) computer-supported collaborative learning simulation. Second, we explored changes in the students’ self-efficacy for using specific media strategies to take political action. Finally, we explored the epistemic (knowledge-seeking) and non-epistemic aims that students set for themselves while participating within our VI, which was designed specifically to address students’ epistemic cognition. Analyses of both the quantitative and qualitative data revealed that students: (1) evinced gains in knowledge about what

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“fracking” is also knowledge about why it is a controversial topic; (2) evinced gains in self-efficacy for civic engagement—a key indicator to students’ likelihood for acting; and (3) were able to understand the politicized nature of a social media post, and therefore reported wanting to pursue knowledge-seeking goals to understand both sides of the argument and the trustworthiness of the information sources. We discuss these results vis-à-vis the literature on epistemic games, which can help students develop the knowledge, skills, identity, and values of a profession.

The challenges of developing citizens for contemporary times

Politics in the United States is currently highly polarized and partisan. This partisanship is partly being fueled by the rise of money in politics to persuade citizens by using both traditional and new media networks. Rich and Kavanagh (2018) have labeled the effects of polarization and shifting views of journalism as “Truth Decay.” They argue that a growing distrust in traditional media and governmental institutions, and the blurring between fact and opinion, is partly a result of our current media and political ecosystems. Further, Kahne and Bowyer (2017) found that young people (ages 15–27) tend to view political messages that align with their views as accurate, and those they disagree with as inaccurate. Even worse, the effect was amplified for those with higher levels of political knowledge. This phenomenon is hardly unique to young people—it can be observed with older adults also, which Kahne and Bowyer noted.

This presents a major challenge for the field of democratic education: Not only are scholars wrestling with preparing young people to participate effectively in the democratic process, but they are also interested in how to prepare young citizens to evaluate media messages and to communicate, coordinate, and take action within the current political media ecosystem (Stoddard 2014). Here we are talking about an understanding of how political views shape media, going beyond the kind of verifying and authority analysis of media sources more often encountered in K-12 education (e.g. Caulfield 2017; Wineburg et al. 2016). We also want students to recognize the role and political perspectives of journalism within the overall political media ecosystem.

Given these problems, two goals drove our research. First, we explored changes in high school students’ self-efficacy, knowledge, and skills for critiquing political media while they participated in PurpleState, which is a computer-supported, collaborative, virtual internship (VI) designed by the second author. Second, we explored the goals that students pursue while participating within our VI, which was designed to address students’ cognitions about the nature of knowledge and knowing. These cognitive processes, called epistemic cognition, are a central feature of critical thinking (Hofer, 2016), which was a central design consideration in producing PurpleState. Both Kahne and Bowyer (2017) and Rich and Kavanagh (2018) advocated for including opportunities to engage critically with political media in school as an antidote to political misinformation. Kahne and Bowyer found that participants who had some training in media literacy were more likely to recognize misinformation as inaccurate. PurpleState is our attempt to address this gap.
A virtual internship to prepare high school students for civic...
ecosystem. All of which are keys to understanding how to effect change as a citizen (Stoddard 2014). Furthermore, the simulation studies that engaged students in civic or political roles, such as the work of Parker and colleagues or those studying the effects of iCivics did not examine the impact on participants’ self-efficacy for political engagement—one of the key predictors for future civic engagement (Levy 2011). Developing this self-efficacy for engaging in the political process outside the classroom entails the transfer of competencies learned in school to actions that students enact outside of school. For this type of transfer to happen, students need to learn these competencies within contexts that are authentic to the contexts in which they are likely to find themselves, such as on social media sites (Raphael et al. 2010).

Theoretical groundings

Epistemic cognition

Hofer (2016) noted that, “at a time when technology has exponentially enhanced our access to information, epistemic cognition researchers have recognized that information and digital literacy are fundamentally epistemological issues” (p. 29). Furthermore, Sandoval (2016) argued that researchers need to explore in greater depth, “how students’ engagement in disciplinary practices affects how they come to understand the nature of particular disciplines” (p. 189). For these reasons, we sought to understand how students’ engagement in civic education practices within a technology-rich curriculum facilitated their understanding about the nature of political communications.

According to Chinn, Rinehart, and Buckland (2014), epistemic cognition refers to the large array of cognitive phenomena that lead people to achieve such things as knowledge, understanding, and useful models. For example, if young people come across a political advertisement and seek more information to see if it is relevant to their lives, they are engaging a number of cognitive resources (i.e. epistemic cognition) that lead them to an understanding of a political issue. Although epistemic cognition includes many constructs, we focus only on one aspect of epistemic cognition because it is especially pertinent to our work with PurpleState.

Epistemic aims

Given the wide autonomy that students are often presented with in social media spaces, there is a great need to examine the types of goals that students set for themselves when they try to understand the political media that they see. We focus specifically on epistemic aims, which “are a subset of the goals people adopt, specifically those goals related to inquiry and finding things out” (Chinn et al. 2011, p. 142). Nonepistemic aims, on the other hand, have nothing to do with attaining knowledge or understanding. For example, some people look for and post news articles onto their social media feeds just to signal to others what their political leanings are rather than to pursue knowledge. According to Chinn et al.’s (2011) model of epistemic cognition, epistemic aims set up individuals for what types of activities they are likely to engage in next. Instructional cues that prompt students to inquire and find things out are likely to set students up for epistemic aims, whereas instructional cues that direct students’ attention away from knowledge-seeking endeavors are likely to set students up for non-epistemic aims (Chinn et al. 2011).
Self-efficacy for civic engagement

Understanding the nature of political communications is one issue, but believing in one’s own capabilities (i.e., self-efficacy) to engage productively in political discussions with others, is quite different. This self-efficacy for civic engagement is a key factor in young people being able to participate in civic life (Levy 2011). A survey from Common Sense Media (Robb 2017) revealed that only 44% of teenagers reported being confident in discerning fake news from real news. Research also indicates that young people (and adults) struggle to identify the authenticity, accuracy, and quality of online sources (Flanagin & Metzger 2007; Fogg 2003; Kahne & Bowyer 2017; Metzger, Flanagin, & Medders 2010).

PurpleState was designed around a local political topic so that we could explore whether developing political communications skills about a more local focus could build students’ self-efficacy for civic engagement.

Our goal was to examine how participating in a VI can foster knowledge of a controversial political issue and the self-efficacy to engage in civic and political action. This is a unique contribution because much of the literature on games and simulations is focused on STEM subjects. PurpleState is designed specifically for a social studies classroom, where epistemic cognition plays a critical role in how students approach their learning (Hofer 2016).

Epistemic games mobilize epistemic cognition and self-efficacy

PurpleState was designed using the epistemic game model of virtual internships developed by Shaffer (2006a, 2006b). Epistemic games model learning by providing a simulated community of practice (Lave & Wenger 1991) for students to interact with others in a learning environment modeled on the practices and values of a professional community. These simulated communities of practice are structured to develop students’ expertise and professional identity, which facilitates knowledge and skill development specific to a profession, and ultimately helps learners internalize the values of these practices (Shaffer 2006b). These simulated communities of practice are related to what Shaffer (2006b) calls the epistemic frame—the skills, knowledge, values, and identity of a professional practice.

Thus, the epistemic frame engages students in solving complex authentic problems using the tools, information, values, and identity of a profession. In this way, epistemic games fit the criteria set for simulations within social studies education (Wright-Maley 2015).

For example, to model the epistemic frame of an engineer, players would be immersed in a virtual environment with others, where players would have to think and act in the ways an engineer would on problems that engineers would tackle. As virtual interns, students work in these epistemic games with other interns and expert mentors to engage in authentic issues or problems within a computer-supported collaborative learning environment designed for the VIs. This experience promotes epistemic understanding in addition to knowledge and skill building (Nash & Shaffer 2013).

The concept of epistemic frames provides a model that could help students transfer their academic experiences to their role as citizens outside of school (Bagley & Shaffer 2009; Shaffer 2006a, 2006b). Therefore, an “epistemology of professional practice” may be a better model for democratic education than an epistemology based on an academic discipline such as history. Here we use an epistemic frame of a political media strategist as a way to help participating students better understand the decisions being made...
by politicians and media companies to influence the public. We argue that the epistemic frame of a VI develops students’ awareness of the political media ecosystem, which they interact with constantly outside of school. We use this frame not because we want them to become media consultants but because this expertise is valuable when transferred to their role as informed citizen. PurpleState was designed to mobilize students’ epistemic cognition by presenting students with decision points in which they are compelled to seek out relevant knowledge (i.e. why do some people in rural areas oppose “fracking” and why do others in the same area support it?) so that they can come to a better understanding of the political landscape and justify their decisions to their team. By structuring PurpleState in such a way, our goal is to authentically compel students to pursue epistemic aims (i.e., understand why some rural voters oppose fracking) rather than nonepistemic aims (i.e., how do I answer this question so that I can just get through this game?). By pursuing epistemic aims, students engage a number of cognitive resources (e.g. inquiry) that lead them to an understanding of a controversial political issue.

By directing students toward knowledge-seeking behaviors within the context of political media communications, we are also helping students to develop the self-efficacy for engaging in conversations about controversial political issues. Students have to wrestle with why people support and oppose the issue, and how to engage productively in a conversation with someone who disagrees with them. These are all skills that can bolster students’ self-efficacy for civic engagement.

We also designed the simulation to teach students to understand both sides of a controversial issue, in this case whether or not fracking should be done in Virginia. Understanding both sides of a controversial issue is important because it helps students understand that reasonable people can disagree on issues, which is a key element of democratic deliberation. Therefore, the values of deliberative democracy would suggest a “best case, fair hearing of competing points of view” (Kelly 1986) that students engage in while participating in PurpleState.

Research questions and hypotheses

The following two research questions (RQ) and hypotheses (H) guided our inquiry:

RQ1: What changes are evident in students’ knowledge of political issues and self-efficacy for political engagement after participating in the VI?

H1: Given the framework and theoretical grounds used to design PurpleState we hypothesized that students would become more knowledgeable about “fracking” (hydraulic fracturing) and why it is controversial. We also hypothesized that, with a more developed understanding and knowledge base of a controversial topic, students would be more self-efficacious in discussing this topic.

RQ2: When faced with political media regarding a controversial topic, what epistemic and non-epistemic aims do students set regarding the content of this political media?

H2: Because of the exploratory nature of this question, we do not forward any specific hypotheses regarding the epistemic and non-epistemic aims students would pursue when faced with political media.
Research design and methods

The purpose of this study was to explore whether and how students’ knowledge of political issues and their self-efficacy for political engagement changed while they engaged in PurpleState. We also were interested in the types of knowledge-seeking goals (i.e., epistemic aims) that students reported they would pursue if they came across political advertisements in social media regarding energy production, and whether these epistemic aims changed after participating in PurpleState. We employed an embedded mixed-methods design (Creswell 2008) to examine changes in participants’ self-efficacy, epistemic aims, and knowledge. An embedded design allowed us to take advantage of the strengths of both quantitative and qualitative data (Creswell 2008). Therefore, the quantitative measures and scored qualitative items focused on measuring outcomes such as knowledge and self-efficacy. They were supplemented by qualitative data collected during the simulation that allowed the researchers to understand how participants experienced the simulation.

We report on data collected as part of the third and final iteration of PurpleState’s implementation. For information on other iterations of this process see Stoddard and Rodriguez (2019). Our team included experts from political communications, civics education, learning sciences, and educational psychology, and partner teachers. This design-based approach allowed us to develop the simulation iteratively in response to data we collected throughout the curriculum implementation (Brown 1992; Dede 2004). This approach also helped us evaluate how students’ knowledge, skills, and self-efficacy changed as they participated in the 10-h curriculum.

Implementing PurpleState

PurpleState is modeled on a political campaign and public affairs firm with which one member of our design team had experience. Tasks, products, and concepts/terminology in the internship are derived from the work of actual interns in the firm he worked for. We also utilized experts from political communications and political behavior; high school civics and government curricula (e.g., textbooks); one author’s extensive background in media literacy and democratic education; and research on youth participatory politics in the United States and Europe (e.g., Banaji, Buckingham, Van Zoonen, & Hirzalla 2009; Kahne et al. 2014). The balance between authenticity and functionality, along with maximum participation and engagement of students, was prominent in our design.

PurpleState takes roughly ten hours to complete, and can be done completely in class, or in a combination of in-class and out-of-class time. Participants are divided into collaborative teams of interns, and work with an account manager (played by a graduate student) who serves as an online mentor. Participants begin by viewing a video from “John,” the non-player character and their boss at PurpleState. They then complete their pre-intervention survey and learn about the online work environment, WorkPro. WorkPro is structured similarly to a project management system and allows students to (a) receive emails from John outlining tasks; (b) participate in chat discussions with their team members and account managers (online mentors); (c) access and share materials and tasks; and (d) submit deliverables. When students finish participating in PurpleState they complete a post-intervention survey in WorkPro.

The first series of tasks introduces participants to PurpleState’s Campaign Design Manual, which outlines key concepts and processes in political communications (e.g., strategies
for reaching target voters). They then apply these concepts through a series of tasks that also support mastery learning through facilitated reflective meetings and requests for revised tasks with feedback.

The second series of tasks then engages students in a collaborative project. They are told that a request for proposals (RFP) was received for a media campaign either for or against a proposed state ban on fracking. This was a controversial public policy issue at the time nationally, and particularly in Virginia where the original simulation was developed. To make the issue also relevant to Wisconsin, which is one of the largest suppliers of sand used in the fracking process, we included additional sources from Wisconsin media on the role of fracking in the state. The team then developed a media campaign proposal for one of two special interest groups (depending on which side of the issue they are assigned), a petroleum industry trade association or an environmental special interest group. This proposal emphasizes political media strategy and a deep understanding of fracking, which is fostered through individual and collaborative research tasks, reflective meetings where strategy is discussed and deliberated, and the construction of a proposal for their client. Structures built into WorkPro, such as feedback from the account manager, support participants throughout the VI.

Finally, PurpleState was designed to be computer-based because we wanted to engage students in the medium that is authentic to the job: an intern at a political PR firm. In doing this kind of job students used static GIS maps to explore county-level data from the state of interest. Finally, there was an online mentor who was giving feedback in real-time to students. Having these online mentors allowed for personalized feedback and structured reflective group discussions.

Sample and research context

A total of 43 Grade 9 students participated in the study. They came from two course sections at a junior high school (housing Grades 8–9) in a mid-sized school district serving several small cities in central Wisconsin (U.S.A). The total number of students in the school district was roughly 6000 during the year the study took place. The two sections where PurpleState was implemented included a civics course (n = 26) and an AP U.S. Government course (n = 17). The junior high school was the only school in the district that was labeled as exceeding expectations on achievement measures set by the Wisconsin Department of Public Instruction. The ethnic makeup of the students at the school include 81% White, 12% Asian American, 1% African American, 3% Latina/o, 2% multi-racial. Ten percent of students had officially identified disabilities and 3% were English Language Learners. Finally, 25% of students in the district came from families designated as economically disadvantaged.

The participants engaged in PurpleState over a three-week period and the researchers worked closely with the teacher to collaborate on helping all students succeed, including the two ESL students and several students with special needs in one class. At the time of the study James (a pseudonym for our school partner to preserve confidentiality) had taught for over 5 years at the school. PurpleState was implemented as part of the regular classroom curriculum, and all students assented to participate in data collection.
Data generation and instruments

Given our research questions, we used a 37-item instrument to assess students’ self-efficacy for civic engagement, knowledge of fracking, and epistemic aims. We worded the items to ensure they were specifically focused on political engagement, the role of media, and issues of fracking. In the current study we did not include other items from this instrument because their psychometric properties were poor or they were not relevant for this present study. Our pre- and post-intervention surveys were distributed to students using Qualtrics immediately before (at Week 1) and after the VI (at Week 3). See Appendix A for a list of all items used in the present study.

Self-efficacy for civic engagement

In developing the items for this particular study, we followed procedures consistent with Bandura’s (2006) recommendations on constructing self-efficacy items. Students’ confidence for being able to engage in political issues was measured before and after participation in PurpleState using a 10-item instrument ($\alpha=0.89$ (pre), 0.95 (post)). The tasks identified for civic engagement centered on: (1) discussing political issues and constructing good arguments; (2) critically navigating digital media spaces that contain political messages; and (3) taking some sort of political action. Although these items do not comprise a comprehensive list of civic engagement activities, they do specifically address the central activities of PurpleState.

Epistemic aims

Students read a memorandum from a polling company, which was sent to a climate change network regarding Maryland residents’ views about fracking in Maryland. To assess students’ epistemic aims we asked students to view the memo, and report what they are likely to do next with this memo if they came across it while they were on social media (e.g. Facebook). In this response, they rank-ordered their choices from “most likely to do” to “least likely to do.” The choices included (a) Look for more information about the polling agency; (b) Learn more about the topic of fracking; (c) Find out more information about the recipient of the memo; (d) Do nothing with it and move on to something else; (e) Re-post the memo on social media; (f) Look for multiple polling results concerning the topic. Students were then asked to provide open-ended responses to their top two choices and comment on “why you might be inclined to do those things.” We coded participants’ responses to this open-ended question for the inclusion of epistemic aims (i.e. goals related to knowledge-seeking) or non-epistemic aims (i.e. goals not related to knowledge-seeking). We then further coded those epistemic and non-epistemic aims to identify what specifically they were (e.g. looking up more information about the polling organization).

Knowledge of fracking

Two questions that required an open-ended response were used to assess students’ knowledge of fracking. First, we asked students to describe in as much detail as possible the process of fracking. One of the authors of the study and a graduate assistant coded the
responses on a scale from one to four. Second, we asked students why fracking is considered a controversial public policy issue in the United States. Responses were also coded from one to four.

For both of these open-ended knowledge items, an initial sample of ten responses for each item (23%) from the pre- and post-intervention surveys (randomly selected) were double scored by one of the authors and a graduate student to assess consistency in scoring and inter-rater agreement. There was a 90% rate of agreement on this initial scoring. For responses where there was disagreement, they were within one point of difference and two raters resolved the differences in scoring. The graduate assistant then scored the remaining items.

Data analysis

Recall that for the first research question we explored the relationship between participating in PurpleState and changes in students’ knowledge about the issue of fracking and its controversies and students’ self-efficacy for civic engagement. We conducted a dependent samples t-test to explore change from pre- to post-intervention on knowledge and self-efficacy.

The qualitative data from open-ended items on the pre- and post-intervention surveys were scored using the developed rubrics described earlier. These responses and the qualitative data included the online chat discussions, participant task submissions, and notes generated by the research team. These data were then coded line by line with a coding scheme developed from key terms and concepts from the simulation, with additional codes produced inductively as needed following a grounded theory approach (Charmaz 1995; Glazer & Strauss 1967).

Results

Recall that our first research question (RQ) addressed how students’ knowledge and self-efficacy changed over the duration of the intervention. Our second RQ explored the variety of epistemic and non-epistemic aims that students pursued, and how they changed as they participated in PurpleState.

RQ1: changes in knowledge and self-efficacy

Table 1 shows descriptive statistics of the main variables in our study. Our analysis of the impact of participating in the VI revealed changes from pre- to post-intervention regarding knowledge of fracking \( t(41) = 13.23, p < 0.0001, d = 4.13 \), and why

<table>
<thead>
<tr>
<th>Variable name</th>
<th>N</th>
<th>T0 Mean</th>
<th>T3 Mean</th>
<th>SD</th>
<th>( M_{T3-M_{T0}} )</th>
<th>( t )-value</th>
<th>( p )-value</th>
<th>Cohen’s ( d )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fracking knowledge</td>
<td>42</td>
<td>1.5</td>
<td>3.0</td>
<td>0.77</td>
<td>13.23</td>
<td>&lt; 0.0001</td>
<td>4.13</td>
<td></td>
</tr>
<tr>
<td>Fracking controversy knowledge</td>
<td>41</td>
<td>1.7</td>
<td>2.9</td>
<td>1.02</td>
<td>4.21</td>
<td>0.0002</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>Self-efficacy civic engagement</td>
<td>41</td>
<td>3.8</td>
<td>4.3</td>
<td>0.83</td>
<td>3.69</td>
<td>0.0007</td>
<td>1.17</td>
<td></td>
</tr>
</tbody>
</table>

Table 1 Changes in Pre- to Post-Intervention Variables
it is controversial \( t(40) = 4.21, p = 0.0002, d = 1.33 \). To provide more context for what these quantitative changes looked like, we present the following analyses of our qualitative data. The examples below illustrate the change in one participant’s responses from the pre- to post-intervention surveys regarding what fracking is and why it is so controversial.

When asked to explain what fracking is, a fairly typical response in the pre-intervention survey was, “I have no idea what fracking is,” which was scored a 1 because it “Fails to convey any specific understanding of the technologies used ... the specific product (natural gas), or the nature of the process.” This same participant’s post-intervention survey response illustrates her growth in understanding the process:

Hydraulic Fracturing or “Fracking” is the process in which a pipe is drilled a couple miles down to a certain type of rock called shale and this rock is rich in natural gas and oil so once the pipe is deep enough to get to the shale rock the pipe is drilled horizontally and small fissures are made in the rock allowing the natural gas and oil to make its way into the pipe. Then chemicals and sand are pumped into the pipe to extract the gas and the oil, then the resources are shipped where they need to go.

This response was scored a 4 as it “Conveys a systematic understanding of the various products, processes, and technologies involved in fracking, and how they play out sequentially.”

Similarly, the responses to the question, “Why is fracking controversial” included rather simplistic understandings at pre-intervention, such as, “some people are strongly for Fracking and others believe it should be left alone, in case it causes harm.” This response was scored a 1 as it “Does not convey accurate knowledge of either the benefits or costs associated with fracking.” However, this same participant’s post-intervention response was scored a 4 as it identifies both the potential costs and benefits of fracking and provides specific examples for both potential costs and benefits:

Fracking is very controversial because it damages the environment by contaminating our water and polluting our air. Research has also shown more earthquakes in fracking areas. Fracking is widely viewed as dangerous and bad for the environment. The opposite argument is that it increases energy and jobs.

Throughout the VI, participants are introduced to conceptual tools from political communications, such as different forms of persuasive messaging and conditions under which they are most effective. Participants also engage with content related to fracking. This content comes in the form of scientific sources and also general journalistic sources that include descriptions of the fracking process and its controversy. As part of the internship, individual tasks cue students to explore and apply their knowledge of (a) fracking, and (b) the conceptual tools from political communications to plan their campaign. This succession of tasks, with feedback provided by the account manager, generally resulted in clearer, more accurate, and well-warranted explanations of what fracking is and why it is viewed as controversial. The VI was designed to help participants develop expertise in this way—both in terms of the issue and in skills related to using evidence and conceptual tools from political communications. To illustrate this, we show Evan’s pre- and post-intervention responses to the question:

**Pre-Intervention:** I don’t know much about fracking, but I do know that you have to dig in the ground and extract things. (scored a 1).
**Post-Intervention:** Fracking is the process which people drill pipes sometimes a mile or two into the surface of the Earth, and then the pipe can go [horizontal] a mile or two, to extract gas from the rocks in the Earth. (scored a 3).

In a task that occurred midway through the VI, which prompted him to research and summarize the fracking process utilizing a number of resources in our WorkPro research database, Evan provided an even more sophisticated description.

**Evan Task:** Fracking is the process of drilling down into the ground before a high pressure water mixture is directed at the rock to release the gas inside. Materials like sand, water and other chemicals, are injected into the rock at high pressure which makes the gas to flow out to the well. Fracking can be conducted vertically, but mostly likely horizontally, by drilling to the rocky layer to create new pathways to release gas. The actual term fracking refers to how the rock is fractured apart by the high-pressure mixture.

In this response, we can see three specific pieces of evidence that directly emerge from this research in Evan’s post-intervention response: Fracking involves (a) horizontal drilling; (b) the use of long piping; and (c) the extraction of gas from rocks. Evan’s shift in understanding fracking is illustrative of participants in Purple State, most of whom were quite uninformed or held naïve understandings about the process of fracking prior to participating in the VI. The most important aspect of this response, however, is the fact that, because of the prompting from the VI, Evan pursued inquiry-related tasks to research the issue of fracking. This illustrates how the tasks we designed within the VI helped develop Evan’s understanding of the fracking process.

We saw similar shifts in participants’ views about why fracking is controversial. In particular, we were interested in participants’ ability to provide arguments for why it might be controversial from multiple perspectives, even though they were working only on one side of the issue. As noted above, we saw a statistically significant increase in participants’ knowledge of fracking and their knowledge of why fracking is viewed as controversial. Students were also more able to provide reasoning for each side of the issue. We found that participants often had a limited view of the issue from one perspective at pre-intervention, but were more likely to provide evidence from both pro- and anti-fracking perspectives at post-intervention, likely as a result of being asked to work with this evidence and devise a strategy for their client.

One example of this is Summer’s pre-intervention and post-intervention response to the item “why is the use of the fracking process considered a controversial public policy issue in the U.S.?”

**Pre-Intervention:** Because some people think it’s not good for the environment and some people do agree that it’s non-harmful (scored a 1).

**Post-Intervention:** Fracking tends to be a very controversial topic because:
(1) Pro fracking - they tend to look at all the goods of it like on how it will save us money on gas in the future and we can lessen our trading with the Middle East on where we get our oil, they think that it could possible better our air.
(2) Anti-Fracking: they tend to look at the negatives on how it can harm people’s drinking water because the pipelines could leak or the water could end up absorbing into the earth and find its way into a reservoir. It can also be loud and do more damage in the end (scored a 4).
Summer’s pre- and post-intervention responses reflect a larger shift than the average participant. This might, in part, be the result of her role in the research phase of the collaborative task, where the team selected specific portions of the research to do, which would inform their proposal. Her role was to investigate the pro-fracking arguments that could be used. Then she used this research, and other research completed by her teammates, to develop the section of the proposal that focused on their overall strategy for their campaign, integrating the most persuasive arguments and themes for their proposal. When combined with the collaborative work of their group for an anti-fracking client, these activities likely influenced her development of a higher-than-average expertise for this particular topic.

In addition to exploring changes in students’ knowledge of what fracking is and why it is so controversial, we were interested in the potential impact of PurpleState on participants’ self-efficacy to engage politically. If students become more knowledgeable about an issue and its controversies, would they also be more self-efficacious about engaging productively in conversations surrounding political topics? We found that students reported higher self-efficacy after participating in PurpleState compared to pre-intervention \( t(40) = 3.69, p = 0.0007, d = 1.17 \).

**RQ2: do students pursue epistemic aims?**

The quantitative results illustrate the potential for using VIs to develop the knowledge and self-efficacy that are considered important for engaging productively in conversations about controversial political issues. For the second RQ we examined the qualitative data to explore what aims or goals our sample of junior high school students reported they were likely to pursue after viewing a political advertisement about energy production, and why.

We were examining changes in their responses—particularly changes in the reasons why they would do what they indicated. Exploring answers to this could give us insights into students’ epistemic and non-epistemic aims.

Overall, when asked about what they would most likely do next if they saw the memo with polling data on it, students evinced minor shifts from pre- to post-intervention. The most frequently identified first choice at pre-intervention was to “learn more about fracking” (\( n = 27 \)) followed by “do nothing” (\( n = 7 \)). There was no detectable pattern in participants’ second choice. On the post-intervention survey, there were only small shifts, with 25 still identifying “learn about fracking” as their top choice.

Although there were only minor pre- to post-intervention shifts in their top-ranked choices, students’ *rationale* for these choices shifted greatly. We asked the participants to provide rationales for their top two choices in the ranking activity. As noted earlier, epistemic aims were selected overwhelmingly in both the pre- and post-intervention surveys.

For the pre-intervention survey, most participants who indicated some sort of epistemic aim indicated that they simply knew little about fracking and therefore would not be able to make any kind of response about the memo without knowing more. For example, one participant noted that, “I am not 100% sure on what fracking is. I would want to learn more so I would be educated on the topic/information.”

On the post-intervention survey, instead of stating that they wanted to learn what fracking is, students assumed the memo had some kind of a political intent and wanted more specific information so that they could understand the different sides’ arguments and the trustworthiness of the information sources. For example, one participant responded “before deciding anything I’d want to know more about the topic of fracking so I would understand why people like and dislike it.” Thus, this participant wanted to find out more about both
sides’ rationales. Others wanted more information to judge the trustworthiness of the information sources. For example, one participant noted, “I already know what fracking is, so I would most likely look to the authenticity of the actual poll.” Students like this referred to the memo assuming that the author of the memo had a political agenda, and that only by finding more information about the source or by corroborating the evidence in the memo would the participant be able to decide about its accuracy or what to do with it (i.e. share it on social media).

Finally, one of the reasons that we saw an upward shift in the number of students who selected “do nothing” as their first choice in the post-intervention survey was their realization, through participation in PurpleState, that the issue of fracking was not salient in Wisconsin. For example, one participant who selected “do nothing” as a first choice noted, “Since I live in Wisconsin and this polling data is about Maryland and about fracking which we don’t have in Wisconsin I probably wouldn’t be very interested so all I would do is nothing.” The rationale was that, as Wisconsin residents, the issue of fracking was not personally relevant to them. How might these students’ rationale relate to issues of authenticity and utility, and whether they pursue epistemic versus non-epistemic aims? We address this next.

Discussion and implications

Our results add to a small but growing base of studies that explore the ways technology-enabled learning activities engage students in civic education. We noted that most studies that used games/simulations typically engage students through the lens of an official role (e.g. member of Congress). But with the outsized role that people and organizations play in the political process, very few games or simulations help students develop the self-efficacy or understandings to navigate the highly mediated space of contemporary politics.

Changes in self-efficacy and knowledge

As noted earlier, much of the literature exploring self-efficacy and political engagement has addressed students’ belief that individual political actions can influence the political process. Such individual political actions can include voting or writing to one’s local representative. However, with the growth of misinformation campaigns, and the ubiquity of politics in social media, all of which can present confusing and negative political information, young people are likely to experience declines in their self-efficacy for civic engagement (Kahne and Bowyer 2017; Rich & Kavanagh 2018). Because we were concerned with developing students’ knowledge and self-efficacy for navigating contemporary political spaces, which often take place within virtual spaces, we saw a need for creating a technology-enabled learning environment and corresponding measures that were task- and domain-specific.

Self-efficacy scholars have long noted that self-efficacy is best measured at a task-specific level (Bandura 2006). So in our study, we adapted our self-efficacy measure specifically to tap into students’ confidence in being able to critique political messages, engage in meaningful discussions about politics, and to do something to address a policy issue. Because PurpleState was designed specifically to address these types of tasks, assessing students’ growth in self-efficacy for this type of civic engagement provides us with a proof-of-concept that an epistemic game like PurpleState can indeed bolster students’ knowledge.
of and their self-efficacy to engage in discourse about controversial policy issues. These findings contribute to a growing base of literature regarding the effectiveness of modeling learning through a simulated community of practice (Lave & Wenger 1991). In such a model, students interact with others in a learning environment modeled on the practices and values of a professional community—a political communications firm, in our case.

PurpleState was designed to develop students’ knowledge to identify and use media to communicate messages about a controversial policy issue to a specific demographic of voters, and to influence their views on the issue. Building on Shaffer’s (2006b) concept of the epistemic frame, we engaged students in solving complex problems (i.e. influencing voters’ views of a controversial policy issue) using the tools, information, values, and identity of an intern at a political communications firm. Although our data are only exploratory at this stage, the research presented here provides preliminary evidence that students can indeed become more knowledgeable and self-efficacious within a context such as civic education.

This is especially notable because knowledge, evidence, and claims in civic education (particularly regarding political communications) are typically less definite and concrete than those from STEM fields such as engineering or physics—a domain where the vast majority of research has been done regarding epistemic games.

Finally, we acknowledge that some readers might think our findings showing gains in knowledge and self-efficacy regarding a topic that students spent 2 weeks immersed in are “mere truisms that any intelligent person might know without going to the trouble of doing social or educational research” (Gage 1991). Why bother doing the research if a reasonable person could infer that students participating in PurpleState, which focuses on civics and political media, would experience gains in self-efficacy and knowledge? Our goal was not just to show the direction of change in these two constructs (i.e. positive growth), but also the magnitude of change. We found that the effect size was quite large for knowledge and self-efficacy gains. Students’ understanding of what “fracking” is ($d = 4.13$) and why fracking is controversial ($d = 1.33$) grew quite substantially. We believe that this finding is helpful in advancing the literature because it shows practitioners and researchers that students going through this curriculum evinced quite substantial knowledge gains—all through an inquiry-based and highly authentic simulation modeled off of the real work of a person employed in a political campaign. Gains in self-efficacy were also quite substantial ($d = 1.17$). Any reasonable person might infer the direction of the change (i.e. positive), but knowing the magnitude of this effect is helpful both for researchers and practitioners who might wonder, “is participating in this virtual internship worth the investment in time and effort to justify its use?” Given these effect sizes, we believe the answer to that question is “yes.”

Virtual internships may prompt epistemic aims while interacting with political media

Both Kahne and Bowyer (2017) and Rich and Kavanagh (2018) have called for educational interventions to address young people’s deteriorating trust in the news media and information sources, as well as their inability to evaluate these sources. Findings from our study provide preliminary evidence suggesting that directing students to pursue epistemic aims (i.e. goals that have to do with knowledge seeking) is an important consideration in designing virtual learning environments such as PurpleState. We saw this play out with Evan, as mentioned earlier, when the VI environment prompted him to research the fracking process and demonstrate that knowledge. Evan did not appear to embark on this inquiry behavior spontaneously on his own. Rather, he had to be prompted. But instead of being told to
do so from a teacher, the context of the VI along with the social values that are inherent to the VI seemed to direct Evan’s cognitive and motivational resources toward the task of researching a controversial issue. Evan’s case, of course, is tentative and preliminary evidence.

Given our preliminary findings regarding the importance of epistemic aims, along with prior work demonstrating the importance of epistemic aims in knowledge acquisition (Chinn, Rinehart, & Buckland 2014), we see an important opportunity for future research. Scholars and practitioners need more sophisticated ways to assess the (non)epistemic aims that students pursue when engaged in media sources. Our current method of assessing epistemic aims asked students to select an option for what they would do next if they saw a particular political advertisement in their social media feed. Although this did provide us with some initial data regarding epistemic aims, future work should use more sophisticated methods than simply asking what students will do next in a hypothetical situation.

A new epistemic frame for democratic education

As mentioned earlier, prior empirical work exploring the learning and motivational affordances of games and simulations has typically placed students in the role of a person who has official power (e.g. Supreme Court Justice). Given the problems in translating the lens of such roles into actionable knowledge that students can apply to their own lives, we designed PurpleState to present an alternative epistemic frame for students to engage in democratic education. With PurpleState, we focused on a professional role in which tasks, knowledge, and beliefs align closely with what democratic educators want young people to know and be able to do within contemporary political contexts and realities. Social media networks are one of the major mediums where influential political groups engage with the public. The results from this study provide preliminary and tentative evidence that a VI can develop students’ self-efficacy to act in ways that are consistent with the epistemic values of being an informed and active citizen such as to closely examine local political issues, and to leverage social media strategically to persuade others. Finally, by engaging students in a VI like PurpleState, educators can couch their learning activities in a specific epistemic frame that allows students to develop the specific epistemic values of a professional, and to pursue the epistemic aims that such professionals typically pursue.

Limitations

There are a number of limitations that we acknowledge. First, although our data were collected within a technology-rich learning context, all of our data are self-reported from students. Second, because this was a pilot project, we only report on a sample of 43 students attending a school in Wisconsin. Therefore, generalizing findings from this study should be done with great caution, especially given the demographics of both our sample and the population from which we drew the sample. Finally, this was not an experimental design. Therefore, no assumptions can be made about whether particular design decisions caused certain student outcomes. Researchers would do well to experimentally manipulate specific design features and include a larger and more diverse sample of students to provide stronger evidence of causality.
Conclusion

If an important educational outcome is to develop students’ ability to participate effectively in today’s highly mediated political spaces, then it is not enough simply to engage students in a technology-rich environment, or to teach them general structures and processes of politics. Rather, learning spaces need to direct students’ cognitive and motivational resources toward specific knowledge-seeking behaviors that are aligned with being an informed and active citizen. Future research could be conducted to explore which types of design decisions can be employed with which types of students to direct their cognitive and motivational resources toward which types of epistemic achievements.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest.

APPENDIX A: SURVEY ITEMS

Pre-Intervention Survey and Post-Intervention Survey

Self-Efficacy for Civic Engagement:

Prompt: If you had to do the following tasks RIGHT NOW, how confident are you that you could do it? Scale of 1 = Not at all Confident to 6 = Completely Confident.

- Participate in an INFORMED discussion of political issues
- Construct good arguments about political issues
- Begin a discussion regarding a controversial political issue with someone who disagrees with me.
- Identify hidden political messages in advertising
- Identify hidden political messages in journalism
- Persuade someone who disagrees with me to REACH CONSENSUS on a controversial issue
- Do something to get local officials to address a problem
- Use social media to effectively communicate about controversial political issues.
- Evaluate the quality of different internet sources of political information
- Take action to address a local policy or social issue
Knowledge of Fracking (2 open-ended items):

Prompt 1: What is the process of hydraulic fracturing or “fracking”? Please describe with as much detail as possible.

Scoring Guide:
1 = Fails to convey any specific understanding of the technologies used (e.g., horizontal drilling, high-pressure water, chemicals), to identify the specific product (natural gas) or the nature of the process (fracturing rocks to release the shale gas inside). Also makes inaccurate assertions.
2 = Conveys understanding that the purpose of fracking is to generate natural gas. Also gives vague/simplistic but broadly accurate descriptions of the basic process.
3 = Conveys a broad understanding of most of the products, processes, and technologies involved in fracking.
4 = Conveys a systematic understanding of the various products, processes, and technologies involved in fracking, and how they play out sequentially.

Prompt 2: Why is the use of the fracking process considered a controversial public policy issue in the US? Please be as specific as possible in your answer. Why do people disagree about whether or not we should use the fracking process?

Scoring Guide:
1 = Does not convey accurate knowledge of either the benefits or costs associated with fracking; does not indicate an understanding of how these benefits and costs conflict with each other (environmental protection vs. economic growth); does not give general or specific examples of the benefits/costs associated with fracking; and makes vague or incorrect assertions that indicate confusion about specifics.
2 = Identifies the benefits of fracking, but not the costs, or vice-versa; and gives general (fracking raises environmental concerns) rather than specific (fracking leads to water pollution) but accurate examples of benefits and/or costs. OR gives a specific example of benefits but not costs, or vice-versa.
3 = Identifies both benefits and costs of fracking; and gives general examples of benefits and/or costs.
4 = Identifies both benefits and costs of fracking; gives specific examples of both costs and benefits.

Epistemic Cognition (Epistemic Aims – two items):

Analyze the source provided below and then answer the following questions.
To: Chesapeake Climate Action Network

From: Steve Raabe, President
OpinionWorks, LLC

Date: March 2, 2015

Subject: Maryland Voter Poll on Fracking

Chesapeake Climate Action Network commissioned this statewide Maryland voter poll to measure citizen attitudes about fracking in Maryland.

This telephone poll of 500 randomly-selected Maryland registered voters was conducted by telephone February 3-11, 2015, using trained and supervised live interviewers. The poll is balanced to reflect the geographic, political, and demographic makeup of the statewide electorate. The findings have a potential sampling error of no more than ± 4.5 percent at the 95% confidence level.

Strong Voter Opposition to Allowing Fracking in Maryland

Two-thirds of Maryland voters (68%) would either ban fracking outright in the state, or would place a long-term moratorium on fracking until studies show it could be done with little risk. Twenty-five percent would ban fracking, and 43% would impose a long-term moratorium.

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Ranking Prompt: If you came across this memo while you were on social media (e.g., Facebook), what would you be most likely to do next? Please drag and drop the items listed below to rank them from top (MOST likely to do) to bottom (LEAST likely to do).

Forced Choice Ranking Options:
Look for more information about the polling agency
Learn more about the topic of fracking
Find out more information about the recipient of the memo
Do nothing with it and move on to something else
Re-Post the memo on social media
Look for multiple polling results concerning this topic

Open-ended Prompt: For the top TWO (2) things that you listed in the previous question, please explain WHY you might be inclined to do those things.

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