Spring 2023

The Impact of Pear Deck on Student Achievement and Perceptions

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Capstone Project: An Action Research Project

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Abstract

This research determined the impact of the interactive technology Pear Deck on student achievement and perceptions of learning. Existing peer-reviewed research on the topic is limited. In this action research, the researcher had one 10th grade Global Studies class learn the subject matter from a traditional teacher-led lecture, while the other class learned the same content using a student-paced Pear Deck. The next class day, both groups took the same assessment to measure their achievement levels. The Pear Deck group also completed a brief survey on their perceptions of learning with Pear Deck. The results of the research revealed the Pear Deck group performed significantly better on the achievement assessment than the control group and had a very favorable perception of learning with Pear Deck. The outcome of the research provides positive quantitative evidence in favor of a shift away from teacher-led social studies lectures and toward a more student-centered classroom involving the use of interactive technology.

Keywords: engagement, interactive technology, student-centered learning, teacher-centered learning, achievement, perceptions of learning, formative assessment, feedback

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As with large university lecture halls, teaching high school social studies has traditionally been teacher-dominated, where "knowledge, as content, is transmitted at a fast pace in a typically one-way communication from the lecturer to the students who take the role of passive and anonymous recipients of information" (Birt et al., 2020, p. 271). Best practices in teaching social studies today, however, point to student-centered learning being better for student learning and engagement. For example, in its National Standards for the Preparation of Social Studies Teachers, the National Council for the Social Studies (2018) recommends educators, "use questions to spark curiosity, guide instruction, and deepen investigations, enabling students to acquire rigorous content, and to develop their knowledge and ideas" (p. 8). It goes on to say the learner-centered approach "positions the learner's socio-cultural assets, learning demands, and individual identities as significant starting places" (National Council for the Social Studies, 2018, p. 22). High school social studies classes clearly need to become more engaging and learner-centered rather than passive and teacher-led. One way a classroom teacher can more effectively engage students in a learner-centered way is through interactive technology tools.

During the instability of the COVID-19 Pandemic, educators were frantically searching for teaching tools to effectively engage students. When learning was fully remote, it was especially difficult to engage students in interactive ways. Technology offered a way to bring learning to life again. Interactive technologies such as Google Jamboard, Nearpod, and Pear Deck quickly became popular for many teachers and students to experiment with for the first time. But, because all of this happened so fast, little research exists on the effectiveness of these interactive technologies on student achievement and perception.

Even though students are learning in-person again, frequent use of technology inside and outside the classroom is not going away anytime soon. Even before the Pandemic, high school students were increasingly using blended, flipped, or fully online learning. Therefore, learning how to effectively engage students in a student-centered manner in high school social studies using the growing number of educational technology tools available is worthwhile. Educators must "design technology-enhanced learning opportunities for all students through the integration of social studies content, digital sources, digital learning tools, and other contemporary technologies" (National Council for the Social Studies, 2018, p. 16) to enhance student learning.

Due to the need for further exploration, this research will focus on one interactive and learner-centered technology tool: Pear Deck. Pear Deck enables teachers to transform Microsoft PowerPoint or Google Slides into a more interactive experience for students. Teachers can add tasks along the way, track student progress, and give feedback through the Teacher Dashboard feature. Therefore, rather than a teacher lecturing while students take notes, students can interact with the content themselves by completing tasks and receiving formative feedback.

Since peer-reviewed research articles are not published on the effectiveness of Pear Deck in the classroom, this action research helps shed light on the issue. Because Pear Deck enables a teacher to move from lecture to student-centered learning, this research highlights this comparison. The purpose of this action research is to determine whether students learn better and are more engaged when using Pear Deck to learn the content rather than through traditional social studies teacher-led lecturing.

Twenty journal articles were selected for the literature review. All the articles were peer-reviewed and published in the last ten years. The sources came from the DeWitt Library online database at Northwestern College and from the Education Resources Information Center (ERIC)

website. The scholarly journal articles chosen for the literature review focus mostly on student achievement and engagement related to the use of interactive technology in the classroom. Articles chosen seek out quantifiable data to compare the effectiveness of student-centered learning to traditional lecture-based. Since this action research uses only quantitative data, all articles selected for the literature review use the quantitative method or are mixed method.

The findings from this research show the learner-centered approach can help improve student achievement and attitudes towards learning compared to traditional, teacher-led content delivery. The data helps prove high school social studies classrooms can shift from teacher-centered to learner-centered, while at the same time, harnessing interactive technology to enhance the learning experience even more. Although the research was performed in a high school social studies environment, the results can also inform middle school social studies teachers and administrators of best practices for student learning of content.

The literature review will begin by discussing existing research on student engagement in learning. This is followed by a discussion of interactive technology in the classroom, with special emphasis on blended learning and formative assessment and feedback. Later, existing research on the impact of student-centered learning on student achievement and perceptions is discussed. These studies help us explore the existing research, while highlighting some gaps this action research study can fill.

Review of the Literature

Student Engagement in Learning

The importance of student engagement with learning is well-documented. It can have positive effects on both perceptions of learning and achievement. At the same time, the word "engagement" can have differing meanings. For example, Moosa (2019) defined student engagement in her study of 1,945 undergraduate students and 18 lecturers as "clear expectations, timely support, assessment and feedback, engaging pedagogies and enhancing teaching skills" (Moosa, 2019, p. 91). In contrast, other researchers have more broadly categorized engagement as either affective, behavioral, or cognitive, and therefore labeled the findings as such (Chen & Fung, 2018). Using her definition on surveys and interviews to see how engaged students were from both the student and teacher perspective, Moosa (2019) found students and lecturers had a significant mismatch on the levels of engagement, especially on expectations, feedback, and interaction (Moosa, 2019, p. 97). To help bridge this mismatch, she recommended teachers spend more time and effort reflecting on what it means to be engaged in the learning.

Understanding student perceptions of engagement when correlated with achievement could help clarify the meaning and importance of engagement for educators. In their research, Chen & Fung (2018) looked at achievement data from 295,416 15-year-old students in 34 OECD countries who had taken the 2012 math PISA, while also giving them an engagement survey. In contrast to Moosa's (2019) research, this research focused on just student perceptions. Results of the research revealed students who engaged more had higher levels of academic achievement, with cognitive engagement having the strongest association with achievement. Specifically, students who had a greater interest in learning mathematics scored 10.48 points more than another who only had an average level of interest, those who had a positive perception of school

scored 4.05 points higher, and students more open to solving new problems scored as astonishing 12.65 points higher (Chen & Fung, 2018, p. 821). It is the role of educators to help build this openness and interest in learning by designing more engaging activities, and in the process, boosting student achievement and attitudes toward learning.

Despite this compelling evidence, the debate continues about how best to engage students: should it be student-centered, teacher-centered, or both? DiGiuseppe et al. (2019) concluded in their findings after they observed students switching between active learning, teacher lecture, and flipped learning for twelve weeks that five characteristics "emerged as being important for learning in general, regardless of teaching approach" (DiGiuseppe et al., 2019, p. 466). These characteristics included clarity, flexibility, opportunities for application, timely guidance and feedback, and cognitive engagement (DiGiuseppe et al., 2019, p. 466). Furthermore, after Nour (2020) interviewed university second language instructors who experimented with additional student-centered learning techniques, an instructor concluded, "Just as a completely teacher-centered classroom would teach nothing, in an extremely learner-centered classroom, little or no learning would take place. Thus, a compromise is required" (Nour, 2020, p. 14). Consequently, it is important to continue this evaluation of the meaning of student engagement as it affects achievement and perceptions with further insight and research. Techniques such as interactive technology could boost these two target areas.

Interactive Technology in the Classroom

Using interactive technology with students could be a solution for increasing student engagement in the classroom. This could hold true in an environment or subject area emphasizing a lot of content in a short amount of time, such as social studies. Teacher-led lectures have traditionally been viewed as the quickest way to relay content to learners. Even

with this framework remaining the same, a teacher can take breaks in the lecture to engage students. For example, Birt et al. (2020) studied the effects of using audience response systems like clickers in an undergraduate university lecture setting on student performance and perceptions. Over the course of eleven lectures, the researchers saw multiple-choice clicker scores increase from 41% to 74% correct (Birt et al., 2020, p. 281). Moreover, results of the perceptions survey showed eighty-three percent of students thought the clickers were "very useful to stimulate their interest in the content of lectures and helps them maintain their concentration during the lecture" (Birt et al., 2020, p. 282). Similarly, results from a Dogan et al. (2022) study showed remarkably high student satisfaction among the fifty preservice teaching students after integrating more engaging technology like Nearpod, Pear Deck and Flipgrid into the classroom. "96% percent agreed that the course engaged them in thought-provoking conversations and useful hands-on activities…and 98% reported satisfaction with the knowledge gained from the course" (Dogan et al., 2020, p. 4-5). As illustrated, interactive technology serves as an effective tool to engage students more in their learning.

Nevertheless, many educators have argued integrating technology into the classroom creates more harm than good. They claim it obstructs the teacher-student relationship by making the teacher less present during the instructional process and students focusing more on their screens than their teacher or classmates. This was in fact some of the criticism stated by some of older students in a South African high school where one-to-one technology was recently implemented. They argued in the open-ended questionnaire that technology can be distracting for them (Boshoff & Laher, 2017). Other research findings, however, revealed sixty-nine percent of the 207 9th grade students saying the relationship with their teacher was just as good or better

after implementing one-to-one iPads in the classroom (BuShell & Higgins, 2018, p. 1078). Furthermore, one of the four teachers interviewed responded,

> My job now is not just to give them the knowledge. You know, in the information age they're surrounded with information. There are so many sources of information, it's our job to help them figure out, to help them learn how to filter that information and pick out what's important, and that is a much more important skill than just finding the information" (BuShell & Higgins, 2018, p. 1081).

Contrary to the claim the teacher is not as present, a teacher mentioned how students feel more connected to the teacher because they can contact them any time of day using the technology (BuShell & Higgins, 2018, p. 1081). And even though some of the 17-year-olds did not like the iPads very much, still of the 285 12–17-year-old students surveyed, sixty-eight percent wanted to continue using iPads in school going forward and said it made learning more fun and engaging (Boshoff & Laher, 2017, p. 205).

Of course, there can be challenges with technology along the way for teachers and students. Alamri (2021) found in his interviews with three university English as a Second Language instructors that implementing more interactive writing technology brought with it some headaches. Their biggest complaints were "the lack of time and technical support, the lack of access and not enough computers, and the lack of adequate training" (Alamri, 2021, p. 41). Overall, however, technology in the classroom can be powerful for student engagement when done correctly and most students and teachers agree.

Blended Learning

One specific teaching method to incorporate interactive technology into the classroom is called blended learning. Some confusion exists about what blended learning is. For sake of consistency, this research uses the definition of blended learning provided by Salim & Uke (2021):

> Blended learning is a combination of face-to-face methods with the use of computers in the learning process. Blended learning is also learning that emphasizes students to learn freely, flexibly, solve problems and be oriented to the real world through the practice of student learning (p. 2).

Still, blended learning can take on many forms such as using specific learning management system platforms or specific techniques to improve learner access. For example, in a study involving third-year university medical students, researchers implemented new blended learning techniques such as recorded lectures and online tasks with over 700 students over a three-year period (Albarrak et al., 2021). Findings from the student survey revealed students preferred blended learning (both face-to-face learning and using technology) over just lectures or just online learning, with over ninety percent of students enjoying the learning process present in blended learning (Albarrak et al., 2021, p. 1). Similarly, Aydin et al. (2018) found from their research of 611 undergraduate psychology students that both student satisfaction and test scores improved after blended learning techniques like recorded lectures were introduced.

Researchers also like to see if a specific technology platform is especially effective in a blended learning environment. Salim & Uke (2021) studied forty-six high school science and social studies students who had used Google Classroom for the school year. Results of the student survey revealed high levels of learning satisfaction. Google Classroom “made it easy for students to access learning resources, fostered student interest in learning, trained student

learning discipline, made students learn anytime and anywhere, [and] supports Blended learning when outside the classroom" (Salim & Uke, 2021, p. 1). Moreover, almost eighty percent of science students said they understood material better when they read it on Google Classroom rather than hearing it from the teacher (Salim & Uke, 2021, p. 4). Blended learning, especially when designed with specific techniques and platforms, can improve student perceptions and achievement of learning.

Formative Assessment and Feedback

It is possible the boost in student achievement and satisfaction in a blended learning environment is at least partially due to enhanced formative assessments and feedback which only interactive technology tools can provide. The value of formative assessments in the classroom to get teacher and student feedback is invaluable to student achievement and perception. Interactive technology might do this better than any one teacher can. Whereas a teacher must read formative assessments after the lesson, technology can tell the student and teacher instantly where intervention or reteaching is needed. Students find this metacognitive process beneficial. For example, using an interactive classroom technology like Pear Deck, Yilmaz (2017) surveyed eighteen undergraduate students about their experience receiving feedback on Socrative. Student responses on the survey were very favorable. One student said, "It helped me to think more deeply. I've seen my misconceptions more clearly by comparing the response of my friends" (Yilmaz, 2017, p. 608).

Mahmut & Yusuf (2021) also found higher test scores for fifty-one 10th grade math students who used frequent formative assessments over a twelve-week period. Test results for the experimental group showed a mean score of over 45 compared to 34 for the control group (Mahmut & Yusuf, 2021, p. 162). Moreover, Birt et al. (2020) believed the consistent clicker

questions during lectures were a significant source of improved student achievement. When students have frequent assessment and feedback, it helps them engage more in the learning. Technology makes this a manageable pursuit for teachers to implement. But at the same time, it is imperative teachers are trained how to use these tools effectively so they too can see the value in formative assessments over just summative ones, as Bartz & Brink (2017) concluded after interviewing teachers who had used frequent formative assessments for the first time.

Impact of Student-centered Learning on Student Achievement

A common theme which comes up repeatedly when engaging students with interactive technology is it shifts the learning process from teacher-centered to student-centered. To see if it is worth switching teaching styles, it is important to know student-centered learning's impact on student achievement results such as test scores. Findings from DiGiuseppe et al. (2019) revealed active student-centered learning had the highest mean quiz score compared to lecture and flipped learning with 103 community college computer science students. The active learning involved students being able to jump right into some programming projects, where they could get feedback along the way. Each learning method was used for two weeks at a time and done twice throughout the twelve-week period. After each two-week unit with the same learning approach, students completed multiple choice questions over learning. Active learning scored an average of 80.8, lecture-based averaged 78.6, and flipped learning was 77.5 (DiGiuseppe et al., 2019, p. 461). Additionally, results from research involving sixty first-year dental students at a Malaysian university randomly placed into three distinct learning groups showed the highest mean score for short-term retention was the student-centered learner group (Gomez, 2019). However, when the same content was assessed six months later, findings showed the lecture group had a slightly higher mean score than the others at 147 compared to 146 and 145. Consequently, one could

argue the results show all three learning methods worked in dental training, and lecture could still have a place in the long-term learning of material.

Nevertheless, the overwhelming bulk of research highlights improved student achievement when student-centered learning is applied. For example, for six weeks Nurbavliyev et al. (2022) studied 10th grade math students using interactive technology tools like Quizlet, Kahoot, and Nearpod. The control group meanwhile continued to passively learn by teacher-centered lectures. Results of the research revealed an average of 13.47 on the assessment by the experimental group and just 11.25 for the control group (Nurbavliyev et al., 2022, p. 707).

Still, most of this research showing higher achievement for student-centered learning involved multiple-choice scores. The reality, however, is much of the student learning assessed today in high school social studies uses higher thinking essay writing. In his research with high school students, Knobloch (2015) found the results of the multiple choice not significant between a student-centered and teacher-centered group. However, on the application essay question, students in the student-centered group were "more likely to explain a contextualized application, think critically, and demonstrate clearer understanding" (Knobloch, 2015, p. 143-44). Many of the learning standards today are high-level thinking skills, and student-centered learning can tackle these better since students have to engage and connect with the learning themselves.

Perceptions of Student-centered Learning

Another important way to measure whether the learner-centered approach better engages students is surveying perceptions and attitudes about it compared to teacher-centered learning. DiGiuseppe et al. (2019) not only tested students on achievement but also surveyed them on which of the three learning methods they liked best. The active learning category got the highest

student survey ratings especially about timely guidance and feedback, clarity and detail, and flexibility of instruction (DiGiuseppe et al., 2019, p. 461). Students really like how the teacher can become the facilitator in learning while they actively do the learning themselves. Moreover, using interviews and observations of thirty-six university second language learners trying out a more active learning approach, Benlahcene et al. (2020) found students "increased their confidence" (p. 212) with the learning likely because they were using "numerous cognitive mediation techniques including questioning, eliciting explanation, [and] demonstration" (p. 209).

In contrast to these findings, other research has found the difference in student perceptions of learning methods not significant enough to draw a definitive conclusion. Belue et al. (2017) surveyed first and second-year University of Alabama medical students about their preferred method of learning after using a range of styles. Results found lecture scored a mean of 3.6, team-based learning scored 4.2, simulation had 4.0, small group case-based learning scored 3.8, laboratory got 3.6, and patient presentation scored 3.8 (Belue et al., 2017, p. 328). Although some of the more hands-on and interactive learning scored better than the lecture, it was not by a significant difference. Furthermore, when separating the averages out by first- and second-year students, the first-year students actually preferred lectures as one of their top learning methods. This study could show lectures still have a valuable place especially when it comes to introductory-level material, which is most of the content high school students learn.

Teachers also have opinions about student-centered learning since they are the ones who implement and observe the effects of it. To find out what teachers' perceptions of learner-centered teaching are, nine university second language instructors were interviewed by Nour (2020) about new implementations of task-based, interactive, and project-based learning. Overall, teacher feedback about the shift to student-centered learning was positive. One

instructor said, “the acquisition of new vocabulary and improvement of learners’ grammar are stimulated by interaction and likely to occur through scaffolding during collaborative work” (Nour, 2020, p. 17). Another instructor said more active learning made students “feel dedicated to acquire the language more effectively in order to achieve more success and better self-esteem and self-confidence in return” (Nour, 2020, p. 20).

To help shed further light on the question of which is more engaging for students, student-centered or teacher-centered learning, this action research compares students who learned with the interactive technology Pear Deck and those who learned with traditional teacher-led lecture in high school 10th grade social studies. Currently, there is an absence of peer-reviewed research directly studying the effectiveness of the popular interactive educational technology tool Pear Deck. Since it is a commonly used tool today in the classroom, it is important to study its impact. This action research analyzes the effectiveness of Pear Deck as it compares to traditional teacher-led lecturing on two fronts: student achievement and student perceptions of it. The hope is by providing some quantitative data on the topic, it will help fill the gap in existing research so educators can be more intentional in the classroom.

Methodology

Research Questions

This research analyzed student achievement and perceptions after students learned social studies content with different pedagogical approaches. These are the two research questions addressed:

Research Question #1: Do high school students learn social studies content better after learning it from a learner-centered technology like Pear Deck or from a traditional teacher-led lecture?

Research Question #2: What are student perceptions towards learning with the Pear Deck technology as opposed to through lecture in the high school social studies classroom?

Participants & Research Site

The research took place at a large suburban high school in Central Iowa. The school district has a student population of 6,960, and the 9-12 grade high school building has 2,278 students. The research was conducted with two 10th grade Global Studies classes. Global Studies is a required year-long course for sophomores at the high school. The course covers such topics as globalization, world religions, and terrorism. Each class had 15 and 13 students, respectively. Both classes are similar demographically. The control group had 9 males and 6 females, with one of those students having an Individualized Educational Plan (IEP). The experimental group had 8 males and 5 females with one student receiving accommodations for a 504 Plan. There were no English Learners in either group. Both groups were predominantly Caucasian.

Intervention & Timeline

The intervention tested on students in this action research was the use of the interactive, student-centered technology tool Pear Deck to learn the content rather than traditional lecture. The impact of Pear Deck was measured by looking at student achievement as well as student perceptions of learning.

The action research took place over four separate class days for one week. The content was learned one class day and the assessment was performed at the beginning of the following day. The block schedule at the school meant classes met every other day for 90-minute periods. The control class group learned the content on February 17, 2023, and took the assessment on February 21, 2023. The experimental group learned the content on February 20, 2023, and took the assessment and survey on February 22, 2023.

Variables

The independent variable studied in this action research is the use of student-paced Pear Deck to learn the content, as opposed to receiving a traditional teacher-led lecture to learn the material. The dependent variable was student achievement on the formative assessment. The assessment was a mix of multiple choice and free-response questions. The experimental group's perception of using Pear Deck was also measured using a Likert scale survey. The three survey questions were independent variables, and the responses were dependent variables. The Likert scale response options for students were *strongly agree*, *agree*, *disagree*, or *strongly disagree*. Both data sets are quantitative.

Measurement Tools

After the control and experimental groups learned the content, the next class day they took the same formative assessment consisting of five multiple-choice questions which covered

the five types of terrorism as well as one free-response question asking them to think critically about what they learned from the lecture or Pear Deck. Since it required higher-level thinking, the free-response question was worth ten points and the five multiple-choice questions were each worth one point, for a total of fifteen points available. The formative assessment at the beginning of class measured student achievement. Only the experimental group completed a three-question perception survey using the Likert scale after the achievement assessment. Both the assessment questions and the survey were made using a Google Form students could access on their Chromebooks. Since the formative assessment and the perception survey were created by the researcher, no information is available on the reliability or validity of them. Results of the assessment and survey were initially securely stored in Google Sheets and then transferred to Microsoft Excel, with students or other educators unable to access individual student results.

Anticipated Statistical Analysis

To address the student achievement research question, mean scores will be calculated out of fifteen on the assessment for both the control and experimental group. Next, standard deviation for each group will be calculated. Then, an independent sample two-tailed *t*-test will determine the size of the difference between the two groups. A *t*-test for independent samples will be used because the action research compares two separate learning groups who took the same assessment. The *t*-test analyzes the difference between the two means, the standard deviation, and size of the group. Then, to see if the difference between the two groups is statistically significant, the *p*-value will be calculated. If the *p*-value is less than 0.05 for the experimental group, this shows me there is statistical significance for using Pear Deck to learn content if it was performed again. As far as reporting the results of the three Likert scale perceptions of learning survey, pie chart data will display percentages of those who responded

strongly agree, *agree*, *disagree*, or *strongly disagree* for each of the three questions. This data was just for the experimental group.

IRB Exemption

This action research study received an exemption from the Institutional Review Board. No student names are given in the data and analysis, and there was no disruption to the students' learning or normal school day.

Data Collection

The researcher conducted this action research with two separate Global Studies groups over two class days. Under the building's block schedule, students at the high school alternate periods every other day resulting in the research spanning four days total. On the first day, each group of students learned the content in a different way, and on the second, they took an achievement assessment and perceptions of learning survey. The unit of study was Terrorism, with the specific lesson covering the Types of Terrorism in the world. The topic was designed by the Global Studies curriculum team and approved by district administrators, as it aligns to 6-12 Iowa Social Studies Core Standards. On the first day, the control group (n=15) learned about the types of terrorism from a traditional Google Slides lecture where the teacher did most of the speaking while students listened and took notes. The experimental group (n=13) learned the same material in a student-paced manner on their school-issued Chromebooks using the interactive technology Pear Deck. The information on the slides was the exact same as the control group, with the addition of three checks for understanding tasks built into Pear Deck along the way (see Appendix). Using the Teacher Dashboard feature of Pear Deck, the researcher could see responses to these tasks and offer personalized or whole group feedback.

On the beginning of the second day, the control and experimental groups took the same formative assessment covering learning from the previous class meeting. Both classes had learned the material two days prior. The assessment was created by the researcher based on the taught content and input from the Global Studies curriculum team. Students completed the assessment on a Google Form they accessed on their Chromebooks. The assessment consisted of two or three parts depending on the group. In the first part, students answered five multiple-choice questions. Each question was worth one point for a total of five points. The multiple-

choice questions were mostly recall of content such as definitions and examples. The second part of the assessment was a ten-point free-response question. The free-response question asked students to think critically about the topic of terrorism; therefore, it was worth double the points. There was no time limit, but students mostly finished the Google Form assessment in less than ten minutes. The multiple-choice questions were graded automatically, while the free-response question was scored by the researcher using a rubric developed collaboratively by the Global Studies curriculum team.

The experimental group, who used Pear Deck to learn the content, also completed a third part of the same Google Form. It was a three-question perceptions of learning survey about their experience learning with Pear Deck rather than lecture. Students selected their choice from a four-point Likert scale: *strongly agree*, *agree*, *disagree*, or *strongly disagree*. The survey statements were as follows: 1) *You were more motivated to learn using Pear Deck than traditional lecture*, 2) Y*ou feel you learned more with Pear Deck than traditional lecture*, and 3) *You prefer Pear Deck (or something similar to it) when learning Social Studies content rather than lecture*. All quantitative data transferred from the Google Form to Google Sheets where assessment results were listed out of fifteen points by individual student. Survey results were grouped by percentage of participants who responded *strongly agree*, *agree*, *disagree*, and *strongly disagree* for each of the three survey questions.

Data Analysis

The first research question addresses whether students performed better on the fifteen-point formative assessment after learning the Global Studies lesson with learner-centered Pear Deck or through a teacher-led lecture. An independent sample t-test analyzed whether the use of Pear Deck factored into a better performance on the achievement assessment. Using the quantitative data collected on the fifteen-point assessment, the results show the group of students who used Pear Deck to learn the content (treatment group) scored an average of 12.77 ($M = 12.77$, $SD = 2.71$, $n = 13$). The group of students who learned the content from a traditional teacher-led lecture (control group) scored an average of 9.6 ($M = 9.6$, $SD = 2.06$, $n = 15$). Those using Pear Deck scored a 3.17-point higher mean on the formative assessment than the lecture group. The results of the independent samples two-tailed t-test revealed a significant difference between the experimental and control groups, $t(26) = -3.965$, $p < .001$. Students who learned the social studies content using Pear Deck scored significantly higher on the assessment the next class day than those who learned the same content with a teacher-led lecture.

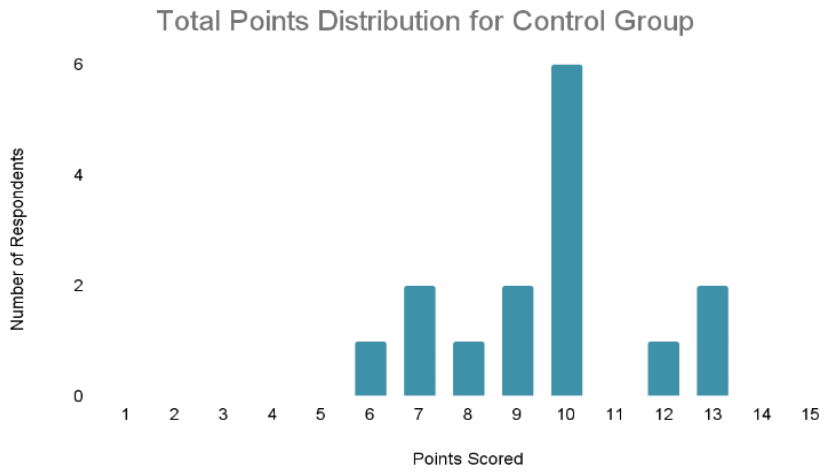
Figure 1

Lecture Group (Control) and Pear Deck Group (Treatment) Assessment Results

Student	Control	Treatment
1	10	14
2	10	8
3	10	10
4	10	15
5	10	14
6	10	9
7	10	13
8	10	15
9	10	9
10	10	15
11	10	15
12	10	15
13	10	14
14	10	
15	10	

Figure 2

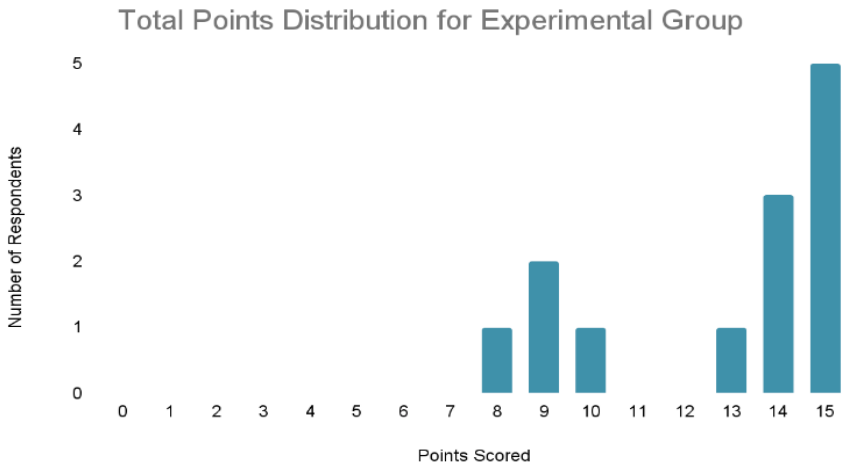
Control Group Assessment Results



Note: Score was out of 15. 15 students took it.

Figure 3

Experimental Group Assessment Results



Note: Score was out of 15. 13 students took it.

In the control group, scores ranged from six to thirteen. Moreover, there were far fewer students who scored above ten points on the achievement assessment at just 20%. Meanwhile, scores in the Pear Deck group ranged from eight to fifteen with 69% of students scoring above ten points. 62% of students in the experimental group scored 93% or higher on the assessment.

Figure 4

Assessment Mean Scores

Figure 5

Independent Samples t-test

T Test: Two-Sample Assuming Equal Variances

	Variable 1	*Variable 2*	
Mean	10	12.76923077	
Variance	0	7.358974359	
Observations	15	13	
Pooled Variance	3.396449704		
Hypothesized Mean Difference	0		
df	26		
t Stat	-3.965380299		
P(T<=t) one-tail	0.000255822		
t Critical one-tail	1.70561784		
P(T<=t) two-tail	0.0005116442		p < .001
t Critical two-tail	2.055529419		Difference is significant

The second research question addresses student perceptions of learning with Pear Deck instead of lecture. They completed a three-question survey using the Likert scale, with choices

being *strongly agree*, *agree*, *disagree*, or *strongly disagree*. For the survey response to *You were more motivated to learn using Pear Deck than traditional lecture*, 92.3% said they *strongly agree* or *agree* (with 76.9% agreeing and the rest strongly agreeing) and the remaining 7.7% disagreeing. For the survey response to *You feel you learned more with Pear Deck than traditional lecture*, results were identical to the first survey question. And in response to *You prefer Pear Deck (or something similar to it) when learning Social Studies content rather than lecture*, 84.7% *strongly agree* or *agree* with the remainder disagreeing. There were more students who selected *disagree* (15.4%) or *strongly agree* (38.5%) to this last question than the first two survey questions. Although *strongly disagree* was an option for all three questions, no student selected this for any question. The results clearly show students enjoyed using Pear Deck. The intervention of using Pear Deck to improve student perceptions of learning proved a reality.

Figure 6

Results of perceptions of learning survey to experimental group: question 1

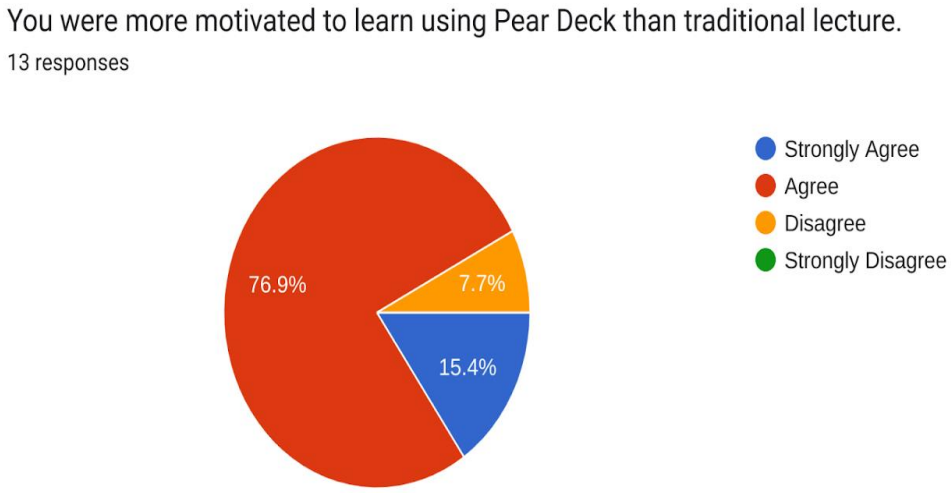


Figure 7

Results perceptions of learning survey to experimental group: question 2

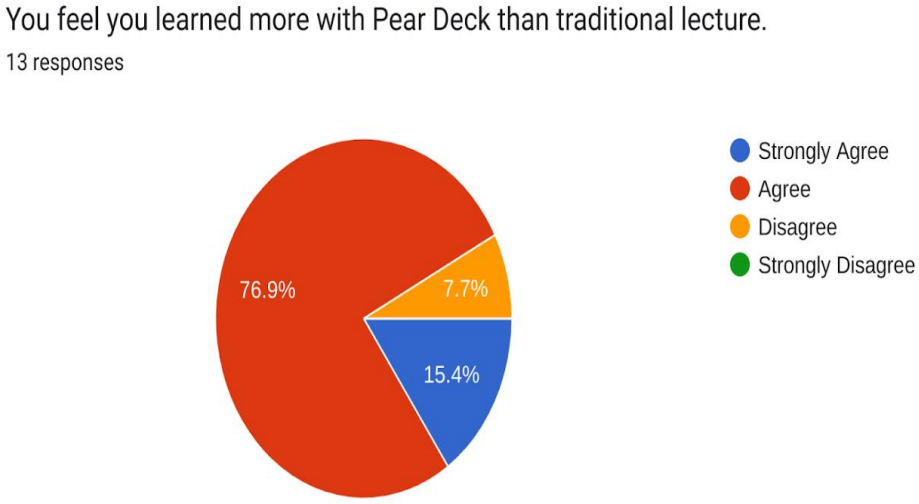
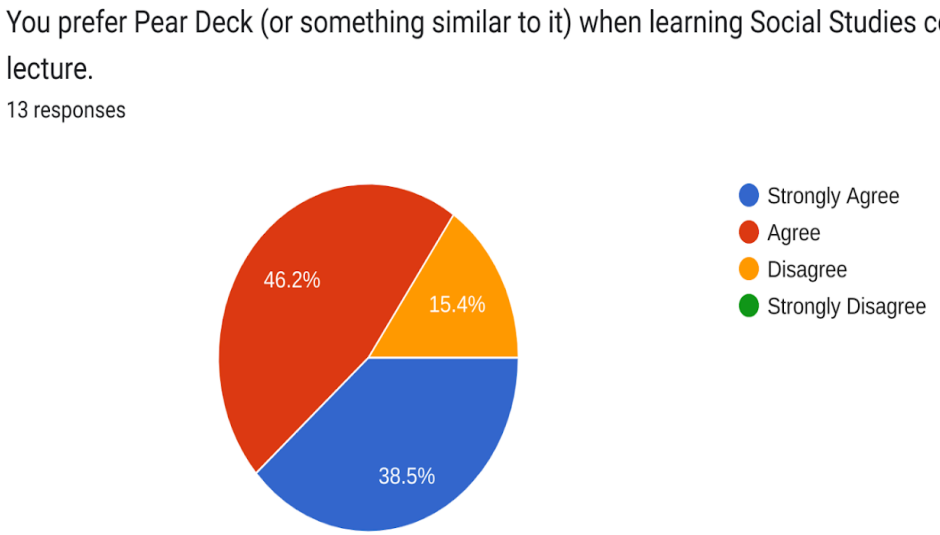


Figure 8

Results of perceptions of learning survey to experimental group: question 3



Discussion

Findings

The findings from the action research revealed positive results towards a more student-centered teaching approach. In this research, the student-centered learning involved the use of the interactive technology tool Pear Deck. Results favored Pear Deck on both student achievement and perceptions of learning. For student achievement, the group of students who learned with Pear Deck scored a significantly higher mean, by 3.17 more points, on the assessment than students who learned the social studies content with a teacher-led lecture. These results show student-centered learning using interactive technology can positively impact learning outcomes.

Even though the overall mean was higher for the experimental group, this was largely due to their better performance on the ten-point free-response question. The multiple-choice averages were comparable: 4.1 for the control group and 4.6 for the experimental group out of five points. The multiple-choice questions focused on lower-level recall of content. Meanwhile, on the higher-level thinking free-response question, the experimental group performed significantly better, averaging 8.2 compared to the control group's much lower average of just 5.5 out of ten possible points. This major difference on the free-response question suggests learning with student-paced Pear Deck may contribute to the development of critical thinking skills. Student-centered learning might enable students to form connections in learning on their own which lends itself to answering higher-level questions. Pear Deck may have forced them to be more engaged and active learners by reading the content on the slides. The Pear Deck group might have also been more engaged because they completed three formative tasks built within the Pear Deck (see Appendix). The tasks were short answer questions encouraging them to think

critically about the material. This may have been good practice for the free-response assessment question the next class day.

In addition to completing these formative tasks, another advantage of Pear Deck is the teacher can view student responses in real-time as they are typing. I was able to share some of the responses to the whole class as well as talk to individual students about their responses. This type of feedback is a powerful tool for student improvement and engagement. Furthermore, just knowing their responses could be displayed to their peers and their teacher, could have motivated them to give more effort than usual.

The findings from the survey clearly show students have a more favorable perception of using Pear Deck compared to lecture. The experimental group liked being more engaged and Pear Deck likely empowered them to be more active in the learning process rather than passively listening to the teacher lecture on the topics. It is also important to note that although *strongly disagree* was an option for all three survey questions on their attitude towards Pear Deck, no students selected this for any question. For questions one and two, it is interesting that *agree* was selected in a much higher amount than *strongly agree*, which might suggest students did not feel fully certain their motivation and learning improved by using Pear Deck. In the third question about their preference for learning, students seemed more divided and opinionated. 38.5% *strongly agree* Pear Deck is better than lecture while 15.4% *disagree* with this. These are significantly higher percentages in both those Likert scale choices than the first two questions which were dominated by *agree* responses.

Impact on Teaching and/or Learning

As a result of this research, high school social studies teachers can reflect on how they most effectively deliver content to their students. They should reconsider delivering content every time with a passive, teacher-centered lecture, and instead incorporate student-centered learning tools like Pear Deck into their instructional toolkit. When students engage in the learning process, they perform better on assessments and are more motivated to learn. Engagement can be achieved in a variety of ways, but using an interactive technology like Pear Deck is one of the best ways because it allows for formative checks along the way as well as valuable teacher feedback. Students normally disengaged during lectures, suddenly worked diligently on the Pear Deck. One such student even asked the researcher the next day if we could do Pear Deck more often.

Alignment to Research

Although there is no existing peer-reviewed research addressing the effectiveness of Pear Deck, this action research outcome is consistent with results from other studies using student-centered learning or interactive technology tools in the classroom. Other educators have incorporated student-centered learning or technology tools into the classroom and seen similar improvements in both achievement and attitudes toward learning.

Limitations

One of the potential limitations of this study is the size and length of it. The research was performed with only twenty-eight total students involved in one Pear Deck lesson. Results could have come out differently with larger sample sizes or with multiple Pear Deck lessons over the school year.

Another potential limitation of this study is the makeup of the two groups tested. One class might have been more intrinsically motivated to learn than the other. The assessment was not put into Infinite Campus as an officially graded assignment. This could have affected assessment results. Furthermore, student learning could have been influenced by outside factors, such as parental involvement and prior academic learning. For example, the research did not consider average student performance in previous Global Studies units of study.

One of the advantages of using Pear Deck is the teacher can input tasks to check for understanding along the way. The responses can be viewed on Pear Deck's Teacher Dashboard in real-time to see if students need feedback or reteaching. The Pear Deck tasks, however, might not have been valid or reliable practice over content for the formative assessment since the researcher created them.

Future Research

Many opportunities to continue the cycle of action research on this topic exist. For example, future research could be done on a larger scale and over a longer time. For example, the study could be performed using more classes over a whole semester or school year. It could also spread to other subjects and grade levels than high school social studies to serve as a comparison.

Furthermore, future research could more closely examine the direct role of formative checks for understanding along with the accompanying teacher feedback on student achievement. In effect, the study could more broadly examine how students best retain information for a summative assessment. To test student differences and growth rates, a pre- and post-assessment would be valuable in this type of future action research.

Of course, effective use of interactive technology like Pear Deck does not happen magically in the classroom. A future study could measure the impact professional training about student-centered teaching practices has on student achievement. It could also expand to other interactive technology tools which have not been peer-reviewed such as Google Jamboard.

Conclusion

Student-centered engagement in learning is commonly discussed in education circles as one of the best ways students learn. Incorporating interactive technology such as Pear Deck is one way to make the classroom more student-centered. The problem is popular technologies like Pear Deck have not been thoroughly studied to test out their effectiveness in achievement or attitudes toward learning. Furthermore, many teachers in the high school social studies world still debate whether student-centered or teacher-centered learning is better. Therefore, this action research compared a class of high school Global Studies students who received a traditional lecture with a class who learned the same material on their own with a student-paced Pear Deck. Both groups took an achievement assessment the following class day, and the Pear Deck group also completed a perceptions of learning survey. The findings from the research revealed a significant difference in the learning outcomes. The Pear Deck class scored significantly better on the assessment, especially on the critical thinking free-response question, and they felt more motivated and engaged in their learning than when learning with teacher-led lecture. Moving forward, this research has clearly shown student-centered learning can be more effective than teacher-centered instruction. The researcher must seriously reconsider his approach to teaching social studies content, so it is more in line with the results of this action research.

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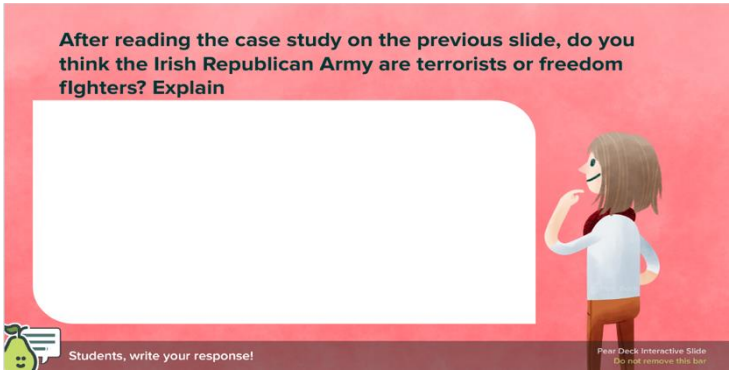
Appendix

Pear Deck Task 1:



Pear Deck Task 2:

Pear Deck Task 3: