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An Investigation into the Use of Escape Games in High School Social Studies Classes: A Mixed Methods Action Research Study

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AN INVESTIGATION INTO THE USE OF ESCAPE GAMES IN HIGH SCHOOL SOCIAL STUDIES CLASSES: A MIXED METHODS ACTION RESEARCH STUDY

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Dedication

I dedicate this dissertation to my family and friends, who supported me over the years of researching and writing. To my parents, who never gave me the stink eye when I ran over to steal their leftovers. To my siblings and in-laws, who put up with me typing on the couch during holidays. To my friends, who didn't abandon me when I backed out of an adventure because I had a deadline. And to Becket, who hasn't had nearly as many walks as she deserves.

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Abstract

This action research study explored the potential approaches to and benefits of educational escape games in secondary school social studies classes. The problem of practice that guided this study is the lack of data on whether or how teachers should use escape games. This study was based on a constructivist theoretical framework and explored the following research questions:

1. To what extent can playing and designing educational escape games advance students' affective development, including engagement, resilience, and intrinsic motivation?
2. To what extent can escape games advance students' cognitive development, including content mastery and critical thinking skills?
3. To what extent can escape games advance students' interpersonal development, including collaboration and communication skills?

The researcher engaged three groups of high school students with two escape games each. The mix of qualitative and quantitative data generated during these interventions was analyzed and brought into conversation with the findings of previous studies on educational escape games. This study generated statistically significant findings that may help fill gaps in the literature on educational escape games. These findings led to the creation of an action plan for the primary researcher and others to further benefit from or conduct research on educational escape games.

Keywords: action research, constructivism, educational escape games

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Chapter 1

Introduction

Background

I can trace the impetus for my action research study back to an insult I received from a student, seven years ago in my 11th grade International Baccalaureate (IB) History course. That course had 25 students, nearly all of them capable of independent work on a high level. Consequently, for one unit on the foreign policy of the U.S. towards Latin America, I assigned students a movie project. In small groups, they had to write, act in, and film a short movie that would illustrate U.S. policy towards one particular country. Students chose Panama, Honduras, Cuba, and so on and made their movies, which turned out great; but I still remember what a student said afterwards.

She was near the top of her class, a very respectful student who went on to do great things in college, and she told me that she had never really learned anything in my class that she could not have found out on her own. That stung, but as I thought about it afterward, I realized she was right. Students had worked hard on their movies and were really engaged with the activity. However, so much of their effort had been spent coming up with jokes, getting cool costumes, filming impressive fighting sequences, and so on, rather than engaging critically with the material. This was creative and interesting work, but the creativity was not tethered to the creation of useful knowledge, and the same criticism could have been laid at my feet after any of my other units. I felt like I had to

choose between giving my students active and engaging lessons and helping them develop their critical thinking, but I could not do both at the same time. At that point in my career, I was not always successful at even doing one of these.

I think my conundrum is common to beginning teachers. We study Bloom's Taxonomy in our teacher training programs, and we expect to efficiently move students up Bloom's hierarchy from low-level thinking to high-level thinking. At first, we are not very good at developing students' cognitive resources at any level of thought, but if we are going to broadly lump cognition into lower and higher levels, most new teachers can improve more quickly at teaching the lower-level forms of thinking.

I will put this in the context of my IB History course. In that course, my students – and I as a teacher – are mostly judged on two large exams. One is the state SC End-of-Course (EOC) Test. It is a straightforward, multiple-choice, content-focused exam, and it is based primarily on lower-level cognitive skills. Applying Bloom's Taxonomy, most of the cognitive effort would be on the "knowledge" or "comprehension" levels (Armstrong, 2017). It is easy for a teacher to read the breakdown of the scores, to see what went well and what went poorly, and to use this feedback to improve his or her practice in future years. I am now confident in my ability to teach students the knowledge and concepts they need for the state EOC Test, though it can be difficult to do this in a way that also develops students' affective and social capabilities.

While Bloom's lower levels of cognitive achievement are important and in fact a precondition for further learning, the International Baccalaureate (IB) program at my school aims to develop the higher levels of cognition in Bloom's Taxonomy. These levels are measured well by the second main assessment for this course, the IB History Exam,

which students take at the end of a two-year course of study. This is a set of five essays and a set of document-based questions. In these essays, students need to develop the ability to think critically and construct knowledge on a more sophisticated level as real historians do.

They must think at the higher levels of Bloom's Taxonomy: analyzing, synthesizing, judging, and creating (Armstrong, 2017). Higher-level thinking in history can involve several approaches. For instance, students can apply organizing cognitive frameworks: game theory, just war theory, Marxism, and so on. From reading about metacognition and modes of analysis, I have come to see that students also benefit from thinking about the limits of their own knowledge. Recognizing the areas of one's own ignorance allows us to work more freely with the data and to see the important questions that open up cognition rather than the simple answers that shut it down (Rosenwasser & Stephen, 2006).

Additionally, my growing understanding of the epistemology of history as a professional discipline influences the cognitive skills I want to impart. I have come to believe that the best models of historical thinking are deeply intertwined with the creative process. "Much of cognitive research insists that thinking is fundamentally inventive, not merely synthetic" (Holt, 1995, p. xiii). Historians take evidence from the past, which is "as chaotic, uncoordinated, and complex as life," and somehow make "sense of that mess, finding or creating patterns and meanings and stories from the maelstrom" (Arnold, 2000, p. 13).

These cognitive resources and others toward the top of Bloom's Taxonomy may not always be evident in students' historical essays. However, in an increasingly

globalized world, my students will need this cognition more than ever. According to a recent article in *The New York Times*, artificial intelligence is going to make a large percentage of current jobs redundant, especially those that do not rely on complicated acts of subjective judgment and creativity (Williams, 2017). People who can cooperate and contribute will also be more able to navigate the modern economy.

A sophisticated understanding of history allows us to draw on the lessons of the past when we make decisions in the present, to explore open-ended problems for which there is no single correct solution, and to engage with the experiences and beliefs of people radically different than ourselves (Gaddis, 2002). These abilities are important in a democratic society, as John Dewey and others have argued (Oliva, 2009), and especially in a diverse one. These abilities might be even more important in a globalized world in which the highest skilled, most flexible, and most ambitious students will succeed (Williams, 2017).

Students will graduate into modern societies, in which they will need to recognize their own areas of ignorance, to sort relevant from irrelevant information, and to have the ability to walk themselves from ignorance to understanding (Wineburg, 2001). In our current political and social climate, recognizing one's own ignorance and thinking one's way out of it are extremely important skills and democratic virtues (Wineburg, 2001). Cooperation, communication, drive, and resilience are likewise necessary for young adults who wish to thrive in a complex world (Oliva, 2009; Schiro, 2013).

These skills are also important in the immediate context of my school and my students' next educational steps. To the extent my students can show these skills on their tests, it can help them gain acceptance to better colleges and to start college with more

credits already earned. My own reputation and teaching position depend to an extent on the results my students achieve. My school is judged by outside administrators and the local media based on the scores students receive. This may not be the best way to structure the educational system, but it is reality.

The need for students to develop critical thinking, communication, intrinsic motivation, and collaborative skills is clear. Teachers have great freedom in how they pursue these goals, and it is not always evident which instructional approach to choose. My student's inadvertent insult four years ago set me on a path to thinking more deeply about this problem.

Problem of Practice

I teach many high-level students, and I want to prepare them to be engaged, collaborative constructors of knowledge. There have been studies of how historians create meaning (Wineburg, 1998), and I have successfully applied constructivist principles in my classroom to help my students do the same. However, our understanding of how students can create knowledge and develop other higher-level cognitive skills is still developing (Shanahan et al., 2016). This means that I and other social studies teachers do not yet have access to the fullest array of educational experiences for our students.

I have reached a point in my career in which I can successfully teach students content, as well as higher-level, constructive thinking practices. Still, I want to diversify my teaching repertoire, and find more ways to develop my students' other capabilities, while keeping or even improving the current level of academic rigor. The other

characteristics I want to develop include engagement, resilience, collaboration, and communication.

Educational escape games represent a class activity that could activate such characteristics in students, while still providing academic rigor. Escape rooms are "live-action team-based games where players discover clues, solve puzzles, and accomplish tasks in one or more rooms in order to accomplish a specific goal (usually escaping from the room) in a limited amount of time" (Nicholson, 2015a, p. 1). However, the literature on the effective use of escape games is in its infancy. Only in the last few years have researchers begun to explore the potential benefits of escape games (Humphrey, 2017). It is not yet clear whether escape games represent an activity that could simultaneously promote engagement, collaboration, critical thinking, and knowledge creation. The problem of practice is thus the lack of data on whether and how escape games can be useful for education.

Summary of Background Literature

Several recent studies have begun to explore escape games with an interest in their use in education. Clarke et al. (2016) developed a framework to analyze the important elements that go into classroom escape games, including the participants, the objectives, the theme, the puzzles, the equipment, and evaluation. Nicholson (2015b) and Rouse (2017) wrote about methods of debriefing to improve student cognitive gains. Multiple studies have developed quantitative and qualitative techniques for measuring the effects of educational escape games on students' learning, social development, and affective gains (Clarke et al., 2016; Eukel, Frenzel, & Cernusca, 2017; Monaghan & Nicholson, 2017). Initial results indicate that students enjoy and engage deeply with

escape games, benefit from the review of previously-learned content knowledge, learn from and cooperate with their peers, think about course material in a new way, and feel greater motivation to continue learning about the relevant content (Clarke et al., 2016; Eukel, Frenzel, & Cernusca, 2017; Monaghan & Nicholson, 2017; Rouse, 2017).

Theoretical Framework

Constructivism is the dominant theoretical perspective of this action research project. Constructivist theory holds that learners actively create their own knowledge, often through a process of negotiation with others (Wiersma, 2008). Constructivists believe that people enjoy learning, especially in a natural setting, and that learning is a life-long process that is vital to citizens in a democratic society (Dewey, 2017). Constructivism is a learner-centered ideology where teachers act more like facilitators than heavy-handed "sages on stages," and students are encouraged to explore their environment in a way that develops their autonomy and self-motivation (Schiro, 2013). Escape games are a natural fit for constructivist classrooms, as students communally develop knowledge and solutions to meaningful and enjoyable problems, while the teacher facilitates in a hands-off manner (Nicholson, 2018). The use of project-based learning, in which students construct artifacts like their own escape rooms, also lends itself to constructivist pedagogy (Grant, 2002).

Purpose of Study

The purpose of this study then was to build on the existing research and investigate the potential benefits and drawbacks of game-based learning for high school history students. More specifically, I planned to design, implement, and assess the use of educational escape games. I also tapped into the potential benefits of project-based

learning by having students collaboratively develop an escape game to be used by future classes (Grant, 2002). I focused on the effects on student engagement, critical thinking, and collaborative abilities. By researching these areas I became able to improve my own teaching practice and better advise my colleagues.

Underlying Causes

The underlying causes of the problem of practice include the need for more alternatives to text- and discussion-based class activities and the potential short-changing of engagement and collaboration as important aspects of social studies education (Oliva, 2009). Other underlying causes are the lack of research into potential academic and affective benefits of educational escape games and into how educational escape games can be effectively designed (Clarke et al., 2016; Humphrey, 2017).

Research Questions

There is much to learn about how escape games can contribute to constructivist, student-centered educational goals in high school social studies classes. In light of this gap in the literature, my research questions are as follows:

1. How do students respond to playing and designing educational escape games in terms of their affective development, including engagement, resilience, and intrinsic motivation?
2. How do students respond to educational escape games in terms of their cognitive development, including content mastery and critical thinking skills?
3. How do students respond to educational escape games in terms of their interpersonal development, including collaboration and communication skills?

Rationale

These questions are the focus of my study because they capture essential elements of student development that I wish to encourage through my teaching, and at the same time they open the door to unexpected insights and conclusions about learning and pedagogy.

Positionality

As an action researcher, I need to reflect on my positionality, thinking critically about the power dynamics, epistemological differences, and issues of identity in my relationship to collaborators and students (Merriam & Tisdell, 2016). Herr and Anderson (2015) write that in-person, qualitative research especially necessitates introspection and action to attend to these concerns about status and power. I take these concerns seriously and plan to seek input from my students and colleagues throughout the course of my research and analysis.

I am directly connected to my problem of practice, as I am a high school social studies teacher who wishes to develop more effective and engaging classroom practices. I am an insider, both with relation to my problem of practice, and with relation to my connection to the students taking part in my study (Merriam & Tisdell, 2016). Because I have a form of official power over these students (largely related to grades, discipline, or recommendations), it is incumbent on me to treat them ethically, for instance by guaranteeing their ability to opt out of the study and to give honest feedback if they participate (Merriam & Tisdell, 2016).

Beyond a passive form of ethical treatment, I use my insider status and authority as a teacher to empower my students as learners and citizens. The transformational model

of leadership, in which leaders value the experiences, opinions, and growth of subordinates, informs my teaching and research (Northouse, 2013). I seriously reflected on the feedback and advice my students and colleagues submit throughout the research project, treating their experience as equal in value to my own. A democratic approach to classroom teaching, advocated by John Dewey, also characterized my use of authority as a teacher and researcher (Oliva, 2009). To ensure that my students who act as partners in my research will be treated ethically, I included only those students who consented to take part in the study. Each student received a written explanation of the voluntary nature of their participation, their confidentiality, and their ability to opt out. Where I referred to student feedback or behavior in my analysis, I preserved their confidentiality or give them a pseudonym. The University of South Carolina's Institutional Review Board determined in April 2019 that this research was exempt from Human Research Subject Regulations. Students did not receive grades based on whether they succeeded or failed at the escape game. Individualized learning plans for students were followed throughout the research. Such steps are necessary to ensure the ethics and trustworthiness of the research (Merriam & Tisdell, 2016).

Research Design

I pursued an action research approach to my exploration of educational escape games. Action research is often used by teachers in their own classrooms with the aim of improving the researcher's own pedagogy or solving a problem they face (Herr & Anderson, 2015). Action research is typically subjective, recursive, collaborative, and bottom-up (Efron & Ravid, 2013). As I was open to adapting my research as I developed initial data and did not plan to conduct a large-scale research project, action research was

well-suited to my needs. My research could also be considered a case study, as it involved a detailed exploration of a particular phenomenon, educational escape games, in my own setting (Mertler, 2012). Much of the data I collected is qualitative in nature and often relied on professional judgment and insight in the face of some ambiguity, which can also be characteristic of action research (Mertler, 2012). I also collected and analyzed quantitative data, which was brought into conversation with the qualitative data, since this mix of data types improves the validity of research (Herr & Anderson, 2015).

I conducted my research at the public high school where I teach in a mid-sized city in the American South. The school is in a district of over 22,000 students (2017-2018 Richland One Demographics, 2018). The school has over 1,300 students enrolled, with a demographic mix of 50% White, 37% African American, 6% Latino, and 7% other (SIC Report, 2018). My school has successful academic, athletic, and artistic programs, and it has a graduation rate of 87.3% (SIC Report, 2018).

I involved students from my Honors Economics class and two Advanced Placement (AP) American Government and Politics classes in my research. The Honors Economics class contained 18 12th graders, of whom 3 are African American, 1 is mixed-race, and 14 are White; 9 are female and 9 are male (Powerschool, 2019). The 3A AP Government class contained 20 11th graders, of whom 2 are African American, 3 are Asian American, and 15 are White; 14 are female and 6 are male (Powerschool, 2019). The 3B AP Government class contained 19 11th graders, of whom 1 is African American and 18 are White; 14 are female and 5 are male (Powerschool, 2019).

I had students in each class engage in an educational escape game in groups of four or five. After collecting and analyzing data on the stage of the intervention, students

engaged in a second educational escape game during class approximately three weeks later. Data was collected and analyzed on the second stage of the intervention as well. After three more weeks, a sub-sample of students designed their own educational escape game for use by future classes. As action research is best done in a reflective and recursive fashion, my research design and pedagogy shifted slightly during the study in response to incoming data and analysis (Efron & Ravid, 2013).

Data Collection and Analysis

I wrote down my observations of student behavior and interaction during each class in which they attempted an escape game, as recommended by Merriam and Tisdell (2016). Then I reflected on these observations looking for patterns and relationships and compared what I observed to other data using my judgment and expertise (Merriam & Tisdell, 2016). After each escape game is over, students completed a questionnaire that measured their affective, cognitive, and interpersonal experiences along a Likert scale, which is recommended for measuring individuals' beliefs, behaviors, and attitudes (Mertler, 2012). This data was tabulated according to mean, median, and statistical significance, and the results were analyzed for meaning and relationships to other data because multiple measures of quantitative data help bring to light different aspects of an intervention (Mertler, 2012). Students also responded to open-ended questions in writing and to semi-structured questions in a group debriefing after each escape game. This data was brought into conversation with the quantitative feedback and informed my attempts to improve the use of escape games in social studies classes as recommended by Rouse (2017) and Monaghan and Nicholson (2017). Finally, the escape games that the students designed in the third stage of the intervention were analyzed according to the type of

thinking they involved. Elements of the newly created escape games were specified according to the framework devised by Clarke et al. (2016), and then coded as representing types of cognition in Bloom's Taxonomy (Armstrong, 2017). The various types of data were analyzed for connections, contradictions, and insights as triangulating multiple sources of data makes conclusions more robust (Herr & Anderson, 2015).

Significance of Study

There is a conflict between the recall-based, essentialist approach to teaching social studies and the more constructivist way I would rather teach. The former approach is preferred – wrongly, I believe – among many policymakers and the general public (Schiro, 2013). In my eight years teaching, I have often taught students who thought that social studies only involved memorizing facts and dates. These students initially did not recognize that social studies involves developing advanced strategies of analyzing, creating, and cooperating and that these strategies will be of great help in the students' lives after high school (Wineburg, 2001). A narrow understanding of the methods and purposes of social studies is common, but it is not impossible for a student to develop this broader and more sophisticated understanding (Wineburg, 2001). I hoped to build on the small amount of literature on educational escape games and better understand how and whether to use escape games in social studies class. This would help me improve my own practice and the practice of my colleagues. It would also help my students become more thoughtful and productive democratic citizens, and society as a whole will benefit in turn (Dewey, 2017).

The audience for this study includes any other educators who would be interested in using escape games in their classroom or school. I provided a rich, detailed account of

my setting, process, data, reflections, and analysis so that other educators will be able to determine how transferable my research is to their situation (Merriam & Tisdell, 2016). For teachers in my own state, escape games may be a useful tool to help students match the Profile of the South Carolina Graduate (2015). Educational escape games may help achieve the state's goals for students, including disciplinary knowledge of social studies, creativity, critical thinking, collaboration, communication, knowing how to learn, self-direction, perseverance, work ethic, and interpersonal skills. Even if other educators decide escape games are not for them, they could find the discussions of constructivist theory or of qualitative action research useful or evocative. My main purpose, of course, was to improve my own classroom practice.

Potential Limitations of the Study

Several potential limitations may threaten the reliability or validity of my study. To begin with, the time-intensive nature of designing effective educational escape games forced me to use a limited sample size to conduct my research. This tended to make the conclusions I draw less statistically significant, though Merriam and Tisdell (2016) imply that much action research is persuasive without showing statistical significance. Thus, the study's purpose is less to establish a statistically rigorous data set and more to begin investigating students' patterns of behavior and cognition so that I can improve my teaching practice. Even with a limited sample size, I found common themes and connections between aspects of escape games and student experience that may help guide my future lessons (Efron & Ravid, 2013).

Another potential limitation of the study is my students' lack of demographic diversity. These students are mostly White Americans from the South, a large majority of

whom plan to graduate from 4-year colleges. The limits on my population diversity do narrow down the transferability of my conclusions to other populations. However, the goal of this study is not to establish universally valid principles; rather, I hope to improve my own teaching and my own students' learning outcomes. I will trust that other interested parties will be able to determine the transferability of my work to their own situations (Merriam & Tisdell, 2016).

Summary and Conclusions

Since I was told by a student years ago that my course did not offer anything to really challenge her, I have been focused on improving my teaching practice, especially with respect to higher-level thinking skills. My interest in escape games has prompted me to consider what types of benefits they could bring if used systematically in social studies classes. Thus, I conducted an intervention with three of the classes I teach in high school. Over the course of six to eight weeks, I engaged my students with two escape games designed to aid their affective, cognitive, and interpersonal development, and then had them design an educational escape game of their own. I gathered an assortment of quantitative and qualitative data about their experiences and achievements and analyzed it to improve my pedagogy and to better understand the possibilities of educational escape games.

Organization of Dissertation

This action research dissertation consists of five chapters. The first chapter has introduced my problem of practice, the need for study, and my research questions. It has explained the purpose of my research and outlined my positionality, research design, measurements and analysis of data, the limitations of my research, and the potential

significance of my study. The second chapter contains my literature review. This chapter provides an in-depth look at the constructivist approach to education, which is the theoretical foundation of this study. The literature review also explores the small set of studies that have investigated educational escape games and identifies gaps in our understanding. The third chapter of this dissertation presents my research design in greater detail. This chapter discusses the student population I will be working with, justifies my sample selected, and reflects on my positionality with respect to my students and my colleagues. The third chapter details the planned steps of my research, including the three stages of the intervention. I also discuss my data collection measures and my plans to analyze and reflect on them. The fourth chapter of this dissertation presents my findings and analysis of them. The fifth chapter presents my conclusions and recommendations for future study and pedagogy.

Glossary of Key Terms

Action research is "an enquiry conducted by educators in their own settings in order to advance their practice and improve their students' learning" (Efron & Ravid, 2013, p. 2).

Escape rooms are "live-action team-based games where players discover clues, solve puzzles, and accomplish tasks in one or more rooms in order to accomplish a specific goal (usually escaping from the room) in a limited amount of time" (Nicholson, 2015a, p. 1).

Essentialism is an educational philosophy focused on "the transmission of the cultural heritage," with emphases on mental discipline and erudition (Oliva, 2009, p. 160).

Chapter 2 Literature Review

Overview

As a high school social studies teacher, I am often concerned with a lack of demanding and interesting class activities for my students. I wish to promote the development of my students across the affective, cognitive, and interpersonal realms. There is a limited literature on educational escape games, which could help meet my classroom needs. However, the literature is far from comprehensive. My problem of practice is the lack of data on whether and how escape games are useful for education. The purpose of this study is to investigate the potential advantages and disadvantages of game-based learning for high school social studies students. That is why I pursued an action research plan to have my students engage with and eventually design educational escape games in my classroom. I hope to improve my own pedagogy and the pedagogy of my colleagues. To help remedy the above-mentioned gap in the literature, I explored and answered the following research questions:

1. How do students respond to playing and designing educational escape games in terms of their affective development, including engagement, resilience, and intrinsic motivation?
2. How do students respond to educational escape games in terms of their cognitive development, including content mastery and critical thinking skills?

3. How do students respond to educational escape games in terms of their interpersonal development, including collaboration and communication skills?

Organization of Chapter

This literature review explores in depth constructivism, which is the main theoretical framework of this study. The review examines constructivist ideas about the nature of knowledge, the role of the learning environment, active learning, social aspects of learning, and cognition. The review also considers the appropriate contexts for constructivist teaching, the role of constructivism in social studies education, the role of the teacher, and constructivist ideas about evaluation, as well as a number of criticisms of constructivist education models. Next is considered the historical development of constructivist, progressive, and learner-centered themes. The potential of this study to affect social justice is considered. The second half of this literature review explores research on related issues, including knowledge in the discipline of history, Bloom's taxonomy, project-based learning, educational escape games, action research, and mixed methods.

Purpose of the Literature Review

The purpose of this literature review is to present a comprehensive overview of existing research that relates to my problem of practice. I aim to synthesize existing knowledge in order to identify unresolved questions and tensions in educational practice that relate to my own classroom experience. The past methods and conclusions of related research provide a foundation on which I may explore these unresolved questions and improve my own practice (Machi & McEvoy, 2016).

Locating the resources for this literature review involved a variety of strategies. I first explored the existing books and articles I had accumulated over my first years of teaching. The better sources had lists of works cited, and this provided a secondary trove of ideas and evidence. I also used the databases JSTOR and Academic Search Complete to locate other related journal articles. Data on escape rooms was scanty, so I resorted more often to using Google to search the entire web for relevant information about these.

Constructivism

Constructivists, often influenced by the work of Jean Piaget, hold that people actively create knowledge, that individuals must take responsibility to play an active role in their own education, and that a healthy society depends on a citizenry that is capable of this active, ongoing learning (Oliva, 2009). Constructivism is related to the developmentalist beliefs of Jacques Rousseau, John Dewey, and others. Developmentalism posits that humans have evolved to naturally enjoy learning, that it is unwise to interfere with this process as it occurs in nature, and that organized education should reflect those educational experiences that occurred before learning was institutionalized (Matthews, 2003).

A constructivist philosophy of education also overlaps considerably with progressivism, and my framework subsumes a number of ideas often associated with progressives like Dewey. For instance, progressives believe learning is an ongoing, life-long process, in which students are more partners in their education than passive receptacles of knowledge (Oliva, 2009). Likewise, the learner-centered ideology is based on constructivist ideas, and so I incorporated elements of that ideology into my framework (Schiro, 2012).

It may be productive to keep in mind that there are multiple types of constructivism. "The constructivist learning theory explains how learners create meaning," while constructivism as an epistemology "refers to a philosophical view that knowledge is constructed through our interactions with one another, the community and the environment, and that knowledge is not something absolute" (Harasim, 2012, p. 12). My theoretical framework emphasizes constructivism as a learning theory, but also includes some epistemological components of constructivism.

Learning Environment

Constructivists argue that learning should occur in real-life situations and is created by the interaction between the individual's experience and the environmental context; new knowledge should build on existing, related knowledge (Wiersma, 2008). Included in this is the learner's "creating cognitive tools which reflect the wisdom of the culture in which they are used" (Ertmer & Newby, 1993, pp. 55 – 56). In social studies this implies that students can be taught through meaningful, real-life situations to think and act like historians (Wiersma, 2008). These real-life, context-rich situations make knowledge more meaningful, relevant, and transferrable (Jonassen, Mayes, & McAleese, 1992).

Active Learning

The role of the learner is to actively create knowledge and construct meaning during learning (Harasim, 2012). Learners actively make choices in a branched rather than linear learning environment (Mergel, 1998). Different sub-schools may emphasize different aspects of this process. Radical constructivism involves individual students creating new knowledge by synthesizing new information into their existing knowledge

frameworks (Wiersma, 2008). Students can create alternate lenses for viewing and analyzing history, for instance, grouping eras by their musical trends rather than their political and military events (Kaiser, 2010). Such constructivist pedagogical approaches were developed partly as a response to perhaps the greatest difficulty for history teachers, getting students to actively engage with class content (Kaiser, 2010).

Social Interaction

Another sub-school is social constructivism, which emphasizes the creation of knowledge through the negotiation and agreement of groups of students, among themselves, and with their teachers (Wiersma, 2008). As knowledge is constructed collaboratively, groups develop a shared understanding of the world, but social negotiation is also characterized by exposure to alternative views that challenge and complicate existing beliefs (Jonassen et al., 1992).

Cognitivist Influence

Constructivist insights also depend on concepts developed by cognitivists, such as the emphasis on the processes of the individual's mind (Ertmer & Newby, 1993, p. 55 – 56). If we are to understand people's behaviors or abilities, we have to pay attention to "what is going on in people's heads" (Tavris & Wade, 2001, p. 25). Constructivism encourages the "process of articulating mental models, using those models to explain, predict, and infer, and reflecting on their utility" (Mergel, 1998). For students to become active learners who are confident in their ability to construct knowledge, they need to develop metacognition, or the ability to monitor and think about their own cognitive processes (Feathers, 2004). Reflecting after acting is an essential component of learning for constructivists (Jonassen et al., 1992).

Uses

An advantage of the constructivist approach is that it is especially effective in exploring higher-level learning. As students move beyond the introductory knowledge acquisition necessary for developing understanding in any field, constructivist learning allows students to deal with "complex and ill-structured problems" (Ertmer & Newby, 1993, p. 57). Jonassen et al. (1992) point to three stages of learning, each of which call for a particular pedagogical approach: introductory knowledge acquisition relies on traditional learning; advanced knowledge acquisition benefits from some application of constructivism; and the highest phase of learning, called expertise, is best approached through a predominately constructivist prism.

While some theorists support using different learning approaches for learners of different levels, "not all theorists support a 'mix and match' strategy for instructional design" (Mergel, 1998). The latter believe that constructivism must be consistently and almost exclusively used to be effective (Mergel, 1998).

Constructivism in Social Studies

Constructivism has contributed a great deal to the epistemology of history. Paul Hirst (1973) developed insights about the distinct nature of learning, truth, and inquiry in the study of history. Hirst has been followed by educators like Sam Wineburg (1998), who argues that while chess masters and physicists build knowledge through a purposeful and linear process of discovery, historians build knowledge through a recursive, meandering process of construction. This conceptualization of historical thinking also builds on the work of cognitive researchers, and Wineburg specifies several history-specific thinking processes like sourcing, corroboration, and contextualization. Kaiser

(2010) argues that current research into the development of teenagers' brains supports the use of individualized research in history classes.

Role of the Instructor

The role of the constructivist instructor is to create meaningful and authentic tasks and to instruct the learner in how to create knowledge and meaning (Ertmer & Newby, 1993). Instruction may include strategies like having students lead discussions in ways that give them agency, mediating small-group discussions, using primary documents in authentic ways, exploring the origin of texts with an eye to their reliability and validity, consulting multiple sources, using lenses to view and analyze the past, and asking open-ended questions (Wiersma, 2008). The construction of knowledge should be "modeled for learners by skilled performers but not necessarily expert performers" (Mergel, 1998). Learning objectives should be flexible and responsive to the learner's needs, as should be instructional methods (Ertmer & Newby, 1993). "Constructivist teachers need to adapt their teaching style, approach, and content to the specific developmental stage of the child" (Matthews, 2003, p. 57). Unfortunately, constructivism's emphasis on individualized goals of achievement and a belief in the subjectivity of knowledge can make it difficult for instructors to create and achieve a common set of learning outcomes (Mergel, 1998).

Evaluation

Jonassen et al. (1992) point out that constructivist understandings of the subjectivity of knowledge and the importance of personal interpretation complicate the evaluation of learning. If knowledge construction is dependent on higher-level thinking, lower-level measures of information recall are inappropriate. Constructivist instructors

thus rely less on traditional assessments of learning and more on process-oriented assessments, self-reflection by the learner, and qualitative variables like learner interactions (Jonassen et al., 1992). Final projects or portfolios could also be used for evaluation (Mergel, 1998).

Reservations

Researchers have articulated several reservations about constructivism. Unique or divergent thinking can be a liability in situations that demand more conformity (Mergel, 1998). As the objectivity of knowledge is called into question, there may be no new standard by which to judge the validity of created knowledge (Matthews, 2003). Widespread suspicion of the scientific method among constructivist pedagogues means that constructivist assumptions about what works in the classroom are untested. Using educational practices that are not based on empirical data "could be considered unethical, an inefficient use of limited educational resources, and as such, a potential disservice for the students who are at the mercy of such interventions" (Matthews, 2003, p. 56).

Matthews (2003) also argues that empirical evidence does not support instructors' matching of their teaching style to the learning style of the student, nor does the evidence support the claimed importance of learning in context. Matthews' review of the literature found that teacher-centered instruction is especially important and effective for primary grade and low-SES students, as both groups are less able to engage in the behaviors necessary for effective constructivist instruction (Matthews, 2003).

Additionally, constructivism is a time-consuming and demanding approach for a teacher, and it is difficult to assess student learning through a constructivist paradigm (Kaiser, 2010). Constructivism might better be seen as a theory of learning than as an

approach to teaching, and if truth and reality are seen as subjective rather than objective, it may be impossible for individuals in a complex society to communicate or even co-exist with each other (Mergel, 1998).

Summary

All in all, constructivism offers the most appropriate theoretical framework for my action research plan. The theory developed from a long line of learner-centered pedagogy, and it has been successfully applied to high school social studies classes. It emphasizes context-rich, active learning, as well as the socially negotiated and subjective nature of knowledge and knowledge creation. Constructivist pedagogy values and can evaluate affective, cognitive, and social development of students. It is thus an ideal framework to use in exploring the creation, implementation, and evaluation of educational escape games.

Historical Perspectives

The core ideas of constructivism and learner-centered ideology have been developing for centuries. As far back as the 1600s, John Amos Comenius (as cited in Schiro, 2013) argued that children should actively learn by doing. In the 1700s Jean-Jacques Rousseau (as cited in Schiro, 2013) noted the natural motivation children have to explore the rich experiential possibilities of the world. He thought childhood should be enjoyable and horizon expanding. The American educator Colonel Francis W. Parker likewise emphasized the importance of joy in educational experiences, and the idea that exploration, real-world activity, and intrinsic motivation are important (as cited in Schiro, 2013).

John Dewey and others of the Progressive School built on these ideas. Dewey argued that children learn through experience and find meaning in the world by actively creating it. He believed that students learn best by solving problems that exist in or reflect the world around them. He believed that communication and collaboration with peers and a facilitating teacher are the foundations of education and that through communication and shared understanding, learners create meaningful experiences (Dewey, 2017). The famous Eight-Year Study found evidence that such learner-centered education prepared children better for the future than did traditional school education (Schiro, 2013).

After some decades in which American education was dominated by traditional ideas, the explicitly constructivist theories of education that arose in the 1960s grew more influential, and self-directed and instructor-facilitated learning became more respected (Schiro, 2013). Learner-centered ideology was influenced by Gardner's theories on multiple intelligences, and hands-on learning, collaboration, and authentic assessment likewise became part of the core of this broad theoretical approach (Schiro, 2013). Montessori (2017) and others refocused attention on the importance of creative action in learning. In the past few decades, Sam Wineburg (2001) has emerged as a proponent of constructivist thinking in history and the social sciences.

The academic exploration of "serious games" in education is a more recent development. Lameras et al. (2017) have pointed to the lack of knowledge about the use and effects of serious games in the classroom. However, they argue that a constructivist theoretic framework, emphasizing collaborative learning and negotiated understandings, is a critical component of balancing the gaming aspect with the pedagogical aspects.

Since 2010 Scott Nicholson has emerged as the key figure in the still nascent academic exploration of education escape rooms (Stone, 2016).

Social Justice

This study has the potential to affect social justice in a positive way. Progressive thinkers claim that when citizens are capable of active, life-long learning, they will tend to construct a better society (Oliva, 2009). What is more, the cooperative, pragmatic framework of progressive-inspired pedagogy opposes authoritarian models of behavior in both the classroom and the broader society (Oliva, 2009).

Educational Escape Games

Recent years have seen a small flowering of research into the adaptation of escape rooms for educational purposes. Scott Nicholson defines escape rooms as "live-action team-based games where players discover clues, solve puzzles, and accomplish tasks in one or more rooms in order to accomplish a specific goal (usually escaping from the room) in a limited amount of time" (2015a, p. 1). Connecting the existing literature on escape games to my overall constructivist theoretical framework and various other theories is an important goal of this literature review. Where possible, I refer to existing literature that specifically refers to "escape games" or "escape rooms." However, at times I expand my focus to the broader literature on "serious games" or "educational games." As Lameras et al. propose, serious games "need to encompass rigorous pedagogical strategies that discern learning theory, teaching and learning approaches, assessment and feedback" (2017, p. 979). The following sub-sections explore the extent to which escape games can meet various educational goals.

Affective Goals

Learner-centered ideology involves treating the student not merely as a means to another educational or societal end, but as an end in him- or herself (Schiro, 2013). The individual's experience is important in its own right, and thus affective qualities such as engagement, mental well-being, resilience, and intrinsic motivation stand on their own as important goals (Schiro, 2013). Benjamin Bloom and others have argued that although "American education has maintained that among its most important ideals is the development of such attributes as interests, desirable attitudes, appreciation, values, commitment, and will power," schools in fact neglect these goals in favor of strictly cognitive ones (as cited in Oliva, 2009, p. 321). This research study treats affective goals as important, and it connects these affective concerns to the achievement of other educational goals, like content mastery, the development of critical thinking, and collaborative ability.

Lameras et al. (2017) explore two important, and related, affective benefits of serious games in education. The first is motivation. Dewey (2017) has argued that students have a natural inclination to learn, and this can be nurtured by the proper educational activities. One benefit of more motivated students is that they will freely and repeatedly choose to engage in educational activities, leading to better learning outcomes, while extrinsic motivators like grades are less effective in promoting student learning over the long term (Nicholson, 2015b). Escape games teach students resilience, as groups that do not solve the puzzles overcome their momentary frustration and look forward to trying again, and in fact they will learn better when the teacher lets students struggle (Rouse, 2017).

Nicholson (2015b), building on Deci and Ryan's self-determination theory, writes that escape games offer students the opportunity to demonstrate mastery, autonomy, and relatedness. These experiences directly contribute to healthy mental attitudes and intrinsic motivation (Nicholson, 2015b).

The second potential affective benefit of escape games is engagement, also called attention. Many facets of a well-designed game can draw in students more effectively than traditional learning activities: for instance, giving students in-game choices that have consequences is a critical component for creating student engagement (Nicholson, 2018). These choices should be of a strategic nature and mentally challenging, rather than simply demanding skill (Lameras et al., 2017). Nicholson (2015b) writes that escape rooms increase student engagement by providing the ability to explore and interact collaboratively with peers. In later research, he added that having a time limit adds urgency, and immersive narratives further increase student engagement (Nicholson, 2018).

Lave and Wenger (as cited in Lameras et al., 2017) find that contextual learning of the type that escape games allow increases students' curiosity and interest toward their subjects. Monaghan & Nicholson (2017) find that the direct physical feedback of puzzles and props in escape rooms increase student engagement, and that a seamless game narrative reinforces learning and links to the real-world importance of the content.

The use of escape games allows for student autonomy and the pursuit of individualized goals, which also contribute to engagement (Nicholson, 2015b). As cited in Nicholson, Bartle developed a schema to characterize the various paths to engagement shown by different types of students. "Achievers" seek mastery of content and skills;

"explorers" value play and autonomy; "socializers" enjoy working with others, and are interested in the relatedness aspect of self-determination theory; and "killers" most enjoy the competitive aspects, which is also a type of mastery (2015b, Following the RECIPE section, para. 3).

Social Goals

"Having a shared environment in which players are working together on a game designed around specific learning outcomes sets the groundwork for active learning and social constructivism" (Nicholson, 2018, p. 45-46). This collaboration with a set of diverse peers will be important for professional success in the future (Humphrey, 2017; Nicholson, 2018). Students practice clear communication of thoughts and findings, and active listening to the theories and conclusions of others (Rouse, 2017). Players learn that they do not have all the answers and need the help of others to progress (Nicholson, 2018). Encouraging students to support each other and celebrate each other's achievements is important (Rouse, 2017). Students can also learn from other's choices and paths during post-activity reflection (Nicholson, 2015b).

Cognitive Goals

The cognitive domain of learning, according to Bloom's taxonomy, involves intellectual knowledge and skills, and the organization of thoughts, concepts, theories, opinions, mental models, and metacognition (Armstrong, 2017). Humphrey (2017) argues that we must align class activities with the outside world to allow students to learn through authentic recreations of what will be expected of them in the future. The narrative of the escape room can allow the student to connect the learning activity to the outside world, and the present to both past and future (Nicholson, 2015b). Further, the

novel nature of the escape game experience contributes to memory formation (Monaghan & Nicholson, 2017).

Shanahan et al. (2016) identify six important goals for students to develop: close reading of historical texts, synthesis and reasoning within and across historical texts, construction and evaluation of links between evidence and claims, application of interpretive frameworks to analyze and evaluate historical claims and evidence, evaluation of historical interpretations, and an understanding of a history-specific epistemology. Escape games have shown some promise in helping students achieve these goals. For instance, keeping journals or playing escape games as a character can help students develop empathy and the ability to see things from others' perspectives (Nicholson, 2018). Rouse argues that solving escape rooms requires players to "take the time to evaluate each clue meticulously, work through possible solutions, and eliminate irrelevant information" (2017, p. 556). Lameras et al. (2017) trace improved learning and performance to in-game task completion, in which players practice sorting relevant from non-relevant information and strategically approaching various tasks with an eye to their relative difficulty.

After the escape game is over, a period of debriefing helps students reflect on and consolidate their cognitive and non-cognitive achievements, as students identify the disciplinary skills they used, the strategic goals they set, and the connections between the game, the things they have learned in class, and their own lives (Rouse, 2017). The game is a "hook," and "students can then proceed to inquiry-based historical thinking activities that build on the ideas in the games" (Rouse, 2017). Debriefing after the game allows students to find meaning in what they have done; as learners they can explore their

emotions, the choices they made, the skills and content they learned and explore the application of these skills and concepts to the outside world (Nicholson, 2015b). In short, the key components of reflection are description, analysis, and application (Nicholson, 2015b). "Without reflection, the experience does not lead to long-term learning" (Monaghan & Nicholson, 2017, p. 59).

Lameras et al. (2017) argue that serious educational games must be designed so that the game mechanics directly correspond to identified learning goals. They propose that educators' neglect of this linkage contributes to the inconclusive data on the effectiveness of games in education. Escape puzzles and problems should begin on the less-challenging end of the intellectual scale and grow more difficult as the game progresses (Rouse, 2017). As the players get better at the game, the challenges should grow more complex. This principle is based on Csikszentmihalyi's theory of flow, and it contributes to motivation and engagement (Monaghan & Nicholson, 2017).

As explained by Armstrong (2017), Bloom's Taxonomy will be helpful in aligning game activities with student learning aims. In the 1950s, Benjamin Bloom developed a framework for describing the cognitive processes students can be expected to perform. This framework was hierarchical in nature, with the lowest level of thinking described as a precondition for each successive higher level of thinking. From lowest to highest, these levels of thinking were:

- knowledge, which involved recall of information;
- comprehension, which focused on understanding knowledge;
- application, involving the use of abstractions in more concrete situations;

- analysis, or the breakdown of ideas into parts, and the investigation of the relationships between those parts;
- synthesis, or the putting together of parts to form a whole;
- evaluation, or the making of judgments (Armstrong, 2017).

Armstrong (2017) writes that in 2001, a group of psychologists and educators issued a revision to Bloom's Taxonomy, and this version elevated the creation of knowledge to the summit of the framework of cognitive processes. This revised framework emphasizes the importance of an active role for the student, especially as one moves up the hierarchy. The group also issued a parallel framework for the types of knowledge. From lowest to highest, the types of knowledge were factual, conceptual, procedural, and metacognitive (Armstrong, 2017). Bloom's framework is invaluable for meeting the standard, proposed by Lameras et al. (2017), that learning goals must be linked to game mechanics.

Role of the Instructor in Escape Games

In their role as game designers, instructors should link game design and learning outcomes (Lameras et al., 2017). During the playing of the game itself, Lameras et al. argue for a flexible, but generally hands-off, role for the instructor: if the game is to flow naturally and the full benefits of contextual learning to be realized, teachers should support students without infringing on their autonomous choices. Meaningful, ongoing feedback is seen as critical to the achievement of goals, whether they be affective, social, or cognitive (Lameras et al., 2017). Teachers should also facilitate the reflective nature of the post-game discussion (Rouse, 2017). Student achievement in serious educational games is best evaluated through a mixture of quantitative and qualitative measures,

especially if we want to validate and encourage different ways of learning and of displaying learning (Lameras et al., 2017).

Project-Based Learning

Project-based learning is rooted in constructivist theory. It is a type of learner-centered instruction that involves students constructing artifacts that are meaningful to them and that show evidence of learning (Grant, 2002). In history, project-based learning could thus be used to support authentic learning experiences. Project-based learning allows for student autonomy and engagement, as well as recognizes a wide variety of learning styles, and the approach proposes that individuals learn well when they can share and reflect on the artifacts they have created (Grant, 2002). Students understand that disciplinary knowledge is open to interpretation and shaped by narrative (Levstik & Barton, 2001). Common features of project-based learning include introduction, deciding the guiding question, finding resources, the investigation, scaffolding, guidance, collaboration, and reflection (Grant, 2002).

Such a project could involve students designing their own educational escape game. This could be even more engaging than playing such a game, as "game creation combines the excitement of playing games with the discipline of understanding course content deeply enough to create challenges about it" (Nicholson, 2018, p. 48). Students especially grow more engaged when they learn that their game will be played by future classes (Nicholson, 2018). When students create their own story, they demonstrate autonomy, which enhances their self-determination and improves their mental state (Nicholson, 2015b). Vos, van der Meijden, & Denessen (2011) found that students who

constructed their own memory game showed enhanced motivation compared to students who simply played a memory game designed previously.

The literature on project-based learning inspired me to have my students design escape games of their own once they had become familiar with the format of escape games. However, I would eventually put aside this aspect of my research, as it failed to contribute meaningfully to my main data and analysis. I do not want to distract from my main body of research by detailing my lack of success, but I have left some references to the student-designed games throughout this dissertation. As Efron and Ravid (2013) point out, action researchers should not hide complications or setbacks from their readers.

Historical Evaluations of Educational Escape Games

Clarke et al. (2016) tried to develop a framework for the design and analysis of educational escape games. They assembled several small groups of teachers who participated in an escape game. After the game, the teachers were asked a series of open-ended questions about their experience. The study reports that the participants found the experience fun, innovative, and engaging. The teacher-participants saw escape games as a potentially useful educational experience and were open to using them in their own classrooms, though they did not actually know how to do this. Clarke et al. (2016) also provided the theoretical framework called escapED for teachers who want to design escape games or use them in their classrooms. The framework is divided into six stages and numerous sub-stages for educators to consider:

- the participants (player background, time available, difficulty level, cooperation v. competition, and number of participants);

- the objectives (learning objectives, single- v. multi-disciplinary, soft skills, and problem-solving);
- the theme (escape mode, mystery mode, narrative design, and stand alone v. nested experience);
- the puzzles (puzzle design, linkage to learning objectives, instructions, and hints);
- equipment (location design, physical props, technical props, and actors);
- evaluation (pre-testing the game, reflection, evaluation of learning objectives, adjustment of the game, and re-set of the game) (Clarke et al., 2016).

Rouse (2017) tried to align outcomes of educational escape game with the Common Core standards for ELA Literacy. She also developed puzzles requiring students to source and contextualize a series of historical texts. However, she writes that "these concepts and skills are introduced only at a basic level and the game is in no way intended as a substitute for deeper-level inquiry projects" (Rouse, 2017, p. 559-560). She also uses escape games as a way for students to review content knowledge, not just as practice for historical thinking skills and collaboration.

Eukel, Frenzel, and Cernusca (2017) designed and implemented a diabetes-themed escape game for pharmacy students. The goal was to follow up traditional classroom learning with an engaging "learning by doing" experience. The teams of students had to solve a linear procession of four preliminary puzzles, each of which produced a clue, the four of which together could be used to solve the final, cumulative puzzle. Students took 23-question pre- and post-knowledge assessments, and the results showed a statistically significant increase in content knowledge, though the study group was not compared to a control group. The students also responded to a set of questions

related to their perceptions of the activity. Results indicated that students thought the escape room was an effective way to review and to learn new material, encouraged them to think about the material in a new way, promoted social engagement and peer learning, and was worth recommending to other learners. At the same time, a majority of learners reported that the escape room made learning more difficult because due to the stress and distractions (Eukel et al., 2017).

Monaghan & Nicholson (2017) detailed the development of, implementation of, and reflection on an escape game for undergraduate pathophysiology students. Students thought critically about the diagnosis and treatment of a patient, and the activity was anchored in a series of physical puzzles. After the activity, students reflected on the experience and their learning goals and achievements. The experience showed clear affective benefits for students: "It appeared that the experience reinvigorated student motivations for taking the course, and for some, their future goals as clinicians" (Monaghan & Nicholson, 2017, p. 60).

Summary

This literature review has explored the nature of constructivism, which is the primary ideological basis for this study. Constructivism emphasizes the personal and conditional nature of knowledge, the role of students in developing knowledge, the importance of social negotiation in the development of knowledge, and the role of activity and independence in learning. The literature review explored doubts and reservations that some educators have about constructivism. I then explored the development over time of constructivist ideas, and the important cross-pollination with

progressives like John Dewey, and learner-centered pedagogues like Maria Montessori. There are also clear links between the use of constructivist pedagogy and social justice.

I explored the literature on the use of educational escape games and tried to sketch out the existing understanding of how escape games can be designed to promote learning. There are promising opportunities for affective learning, including the development of feelings of autonomy, engagement, and intrinsic motivation. There are possibilities in the social realm as well as educators have explored the collaborative benefits of escape games. There are also potential intellectual and cognitive benefits, though the literature is not extensive in this area, and it is one of the goals of my study to improve our understanding of this. The literature review explored the role of project-based learning in achieving educational goals, and it summarized several of the most relevant education escape game studies.

Chapter 3

Research Design

Overview

As a high school social studies teacher, I am constantly in search of better ways to engage my students in high-level thinking and problem solving. There has recently been a small amount of research into the benefits of escape games in the classroom. However, I have seen enough educational fads and gimmicks come and go that I am skeptical of approaches to teaching and learning that suddenly pop onto my radar. My problem of practice is that there is not yet enough data on whether and how escape games can really be useful for education. If I can help fill this gap in the literature, it would be a significant boon to my own teaching practice and to that of my like-minded colleagues. My research may also allow my students to better meet their academic and post-academic challenges.

In this study, then, I pursued the following research questions:

1. How do students respond to playing and designing educational escape games in terms of their affective development, including engagement, resilience, and intrinsic motivation?
2. How do students respond to educational escape games in terms of their cognitive development, including content mastery and critical thinking skills?
3. How do students respond to educational escape games in terms of their interpersonal development, including collaboration and communication skills?

Research Design and Intervention

Action research usually involves research that practitioners undertake in their own school or classroom for improving their practice and their students' learning. Efron and Ravid (2013) write that it is often collaborative, bottom-up, subjective, and cyclical, while traditional research, in contrast, is often top-down, undertaken by outsiders, "objective," and universally applicable. These authors posit that action research is appropriate for problems that are personally significant to the researcher, will contribute to personal and professional growth, will help students, colleagues, or the community, and are feasible in terms of time, resources, and access. Herr and Anderson (2015) write that the best action research tends to be interdisciplinary, to involve all stakeholders as active subjects rather than objects, to be evidence-based, collaborative, and value-laden, and to be transferrable.

The slightly different focuses of the two above textbooks are useful together, as they provide the action researchers with guidance as to both their subject and their behavior. My problem of practice is a good fit for Efron and Ravid's (2013) ideas because I think the development of data on the use of escape rooms in social studies classes is significant, will greatly help my students, and is very feasible based on my teaching position. As I designed my research, I was also in a position to make sure it meets the suggestions of Herr and Anderson (2015). I have a great deal of freedom to teach students the way I deem best, and my administration has always been supportive of teacher attempts to experiment and improve instruction. My students and teaching colleagues are generally happy to collaborate in these experiments. These considerations also urged me toward an action research approach.

More specifically, Mertler (2012) might diagnose my research as an observational case study, which is a detailed, mostly qualitative, examination of a particular setting, event, subject, or phenomenon. Merriam and Tisdell (2016) argue that emergent, flexible studies are ideal for such qualitative research. This is why, as Mertler (2012) encourages, I allowed my research plan and pedagogical approach to respond immediately to data gathered early in my study.

Context and Setting of Study

I teach social studies at a public high school in a mid-sized city in the Southeast. I have taught for eight years, all at this school. My school runs an A/B Day schedule, with four classes per day, each meeting every other day for approximately 100 minutes each. I teach three classes per day with one block of planning time. Most years I teach IB History, AP American Government and Politics, and Honors Government/Economics.

My district mostly covers an urban area, though it includes some neighborhoods that are considered more suburban. According to the 2017-2018 Richland One Demographics (2018), there were 22,939 enrolled in total, with 11,488 in 28 elementary schools, 5,053 in 9 middle schools, 6,062 in 7 high schools, 124 in special schools, and 212 in charter schools. Ethnically, the students in my district were 73% Black, 19% White, and 8% other; 72% received free/reduced price lunch (2017-2018 Richland One Demographics, 2018). There were 2,057 teachers in my district (2017-2018 Richland One Demographics, 2018).

In 2017-2018 my high school had 1,389 students enrolled; ethnically, they were 50% White, 37% African American, 6% Hispanic, and 7% other (SIC Report, 2018). The graduation rate in 2017 was 87.3% (SIC Report, 2018). My school offers the

International Baccalaureate program for juniors and seniors, and of approximately 68 IB students, 87% received their IB Diplomas (SIC Report, 2018). My school also offers 14 Advanced Placement courses to 906 students, which is 64% of the overall student population (SIC Report, 2018). The student theater, dance, and choral programs put on a number of productions each year, and the athletic programs win many district and state championships annually (SIC Report, 2018). Students taking the End of Course Exam in U.S. History passed the 2017 test at a rate of 62.7% (SIC Report, 2018). The senior class in 2018 had 6 National Merit Finalists, 7 National Merit Commended Students, and 91 High School Scholars, while the IB senior class alone earned over $8.5 million in scholarships for college (SIC Report, 2018).

General Description of Intervention

To address my problem of practice and learn more about the possible benefits of educational escape games, I engaged my students with several of these escape games over the course of six weeks. Students played the escape games in small teams of four or five. I gathered data about their learning and their subjective experience. I analyzed this data, and applied the lessons learned to the design of a second round of escape games with these students. Data was likewise gathered from this round of the intervention. In the third round of the intervention, I had students design educational escape rooms for use by their classmates. I used the student-designed escape rooms as additional sources of data.

Role of Researcher

Positionality means awareness of and responsiveness to the teacher-researcher's status in broader educational, institutional, social, political, and other contexts (Herr & Anderson, 2015). In qualitative research especially, it is important to recognize, identify,

and account for one's place in power relationships, one's goals, methods, and epistemology, and one's implicit beliefs and unexamined behaviors (Herr & Anderson, 2015).

The personal value that most influences my actions as a teacher on a daily basis may be my belief in democratic classrooms. Classroom leadership can be especially effective when the setting is seen not only as a place for gaining information, but also as a place of personal and interpersonal growth. The learning community should be a place of mutual understanding, shared goals, respect for diversity, and comfort in taking risks and making mistakes. Democratic validity, which is very important in terms of the ethical demands of my research, involves considering the viewpoints of my students, even if they will not have an equal say in designing and executing my research (Merriam & Tisdell, 2016).

In my classroom, transformational leadership is central to my personal philosophy. According to Northouse (2013), this approach to leadership emphasizes the beneficial change and development that subordinates experience under a good leader. The leader treats subordinates as whole people, rather than as mere components in a machine. I value the role of intellectual stimulation of subordinates, which pushes them "to be creative and innovative and to challenge their own beliefs and values as well of those of the leader and the organization" (Northouse, 2013, p. 193). This form of leadership promotes a shared vision, models desired behaviors for subordinates, challenges the status quo, helps others to act, and creates non-transactional rewards for success (Northouse, 2013).

I did not want students to believe that I expect certain responses on their feedback sheets, or that I only wanted to hear about the successful aspects of the intervention. To that end, I emphasized the importance I put on actually improving my teaching, rather only asking for positive reinforcement. All the students in the intervention had taken government courses with me, and in those courses, I intentionally modeled the practices of arguing graciously, and of giving and taking criticism without taking offense. I also made it clear that students' grades would in no way depend on their achievement during or feedback after the interventions. Students remained confidential in their feedback sheets, and if in my analysis I referred to their verbal feedback or other behavior, I preserved their anonymity or gave them a pseudonym. The University of South Carolina's Institutional Review Board determined in April 2019 that this research was exempt from Human Research Subject Regulations. I provided each student with an explanatory form that emphasized the voluntary nature of the student's engagement in the intervention, student confidentiality, and student ability to opt out. Students who preferred to opt out of the intervention would not have been penalized but would have engaged in a different assignment while we conduct the intervention. During the intervention, any students who have specialized learning plans or accommodations were accommodated as usual. All the above-mentioned considerations are good practice in action research. Merriam and Tisdell (2016) underscore the importance of the ethics of the researcher – without ethical conduct towards methods, data, and most importantly participants, they argue that research is not rigorous and trustworthy.

I have seen in my own practice some of the problems of top-down control of education. In response I have come to believe that much of what may be wrong with the

educational system can be solved by educational professionals on a local level, working to improve the curriculum based on the needs of their particular student populations. I definitely agree with the call for using schools, districts, or states as experimental laboratories for determining what could work on a larger level (Joseph et al., 2000).

I plan to offer the expertise I develop to other teachers in my school, district, and beyond. In my own school, I meet with my fellow social studies teachers several times per month, and those in my district several times per year. We share strategies and debate philosophies, and I hope to contribute more meaningfully to these discussions with the results from this research. Beyond that, I also plan to reach out to those teachers I sometimes collaborate with on an online forum. I have learned a great deal from them, and this may present a way to repay them. I hope to serve the broader community and to lessen the lack of resources that currently hamper many beginning teachers. Such collaboration will also help me shore up the dialogic validity (Merriam & Tisdell, 2016) of my study by discussing and debating it not only with members of my cohort in the Curriculum and Instruction program, but also with my colleagues in my history department, my online community of IB History teachers, and my students.

Participants

The participants in my study were the students in three of my social studies classes at a largely urban high school, in a medium-sized Southeastern city. Since I only conducted research with students in my own classrooms, this could best be described as a micro-level study.

There were 18 12th grade students in my Honors Economics class (Powerschool, 2019). Three are African American, 1 is mixed-race, and 14 are White; 9 are female, and

9 are male (Powerschool, 2019). None are English-language learners, and 3 have individual educational plans (Powerschool, 2019). In terms of their GPAs compared to the rest of the senior class, 6 are in the top quintile, 4 are in the second quintile, 3 are in the middle quintile, 3 are in the fourth quintile, and 2 are in the bottom quintile (Powerschool, 2019).

The Advanced Placement American Government and Politics students were in two different sections, which I refer to as 3A and 3B. There were 20 11th grade students in my 3A AP Government class (Powerschool, 2019). Two are African American, 3 are Asian American, and 15 are White; 14 are female, and 6 are male (Powerschool, 2019). Three are English-language learners, and none have individual educational plans (Powerschool, 2019). In terms of their GPAs compared to the rest of the junior class, 13 are in the top quintile, 6 are in the second quintile, 1 is in the middle quintile, 0 are in the fourth quintile, and 0 are in the bottom quintile (Powerschool, 2019).

There were 19 11th grade students in my 3B AP Government class (Powerschool, 2019). One is African American, and 18 are White; 14 are female, and 5 are male (Powerschool, 2019). None are English-language learners, and none have individual educational plans (Powerschool, 2019). In terms of their GPAs compared to the rest of the junior class, 15 are in the top quintile, 3 are in the second quintile, 0 are in the middle quintile, 1 is in the fourth quintile, and 0 are in the bottom quintile (Powerschool, 2019).

When designing a study's approach to sampling, the purpose of the study is an important first question. If the study is quantitative, and the goal is to develop widely generalizable findings, then probability sampling is advisable; however, in qualitative research, where the goal is often to explore a more local problem in depth, non-

probability sampling is accepted and expected (Merriam & Tisdell, 2016). Researchers need to ask themselves what type of sampling will produce the most useful data about the phenomenon they wish to study and explain and account for their subjectivity; researchers should explicitly discuss the criteria that shape the sampling (Merriam & Tisdell, 2016). Merriam and Tisdell (2016) explain a number of approaches to sampling that could be useful, depending on the goals of the study and the resources available to the researcher. A "typical" sample would be selected when researchers want to explore the most common type or results of the phenomenon of interest. Where the researcher is constrained by time or resources, "convenience" sampling may be the only way to carry out a study. I chose my own students to participate in the study largely because they are typical of the students I teach every year. Typical sampling may provide for the transferability to the greatest number of contexts (Merriam & Tisdell, 2016). I also chose my own students because of convenience, as it was easier for me to adapt to developments in my study as it progressed.

In some qualitative case studies, researchers sample at multiple stages of the research: first to pick the case, and then to select the units to be analyzed within that case. Many researchers, like Stillisano et al. (2011), embed a smaller sample to study qualitatively, within a larger quantitative study. I did this with the third stage of my intervention, when students were designing their own escape games. This allowed me to investigate more deeply the escape games they produce.

Data Collection Measures, Instruments and Tools

Though some of the data are analyzed quantitatively, the heart of this study would perhaps best be characterized as qualitative (Merriam & Tisdell, 2016). It is clearly

focused on meaning, understanding, and process, the findings are richly descriptive, and much of the data will be feedback written or spoken by students themselves. I triangulated my findings with a mixture of qualitative and quantitative evidence, which as Herr and Anderson explain (2015), greatly enhances process validity. Triangulation can involve the use of multiple sources of data, multiple theoretical approaches, multiple methods of data collection, and multiple investigators (Creswell & Miller, 2000).

The primary source of quantitative data was a questionnaire with series of statements and questions about students' overall experience during the escape game (See Appendix A). Students were asked to respond to the questionnaire immediately after each round of the intervention. This data went toward answering the research questions and toward improving the escape games used in the future. Students responded to 11 statements using a five-point Likert scale with a range from 1 (strongly disagree) to 5 (strongly agree). Mertler (2012) writes that such "rating scales can be used very effectively to measure students' attitudes, perceptions, or behaviors" (p. 134). Students also responded to three open-ended questions about their likes, dislikes, and suggestions. It is important that study design not occur out of context with the existing literature, but that we carry out a "dialogue" with previous researchers (Merriam & Tisdell, 2016, p. 90). My questionnaire was thus be adapted in part from questionnaires developed by Eukel and Frenzel (2017) and by Giang et al. (2018) to research educational escape games.

Table 3.1

Items of Questionnaire Completed by Students after Escape Game

Dimension	Item	Statement
Engagement	AFF1	The escape game was interesting and engaging.
Distraction	AFF2	The puzzle aspects of the escape game were a distraction from learning about content.
Resilience	AFF3	The escape game motivated me to keep trying when I faced temporary setbacks.
Intrinsic Motivation	AFF4	I wanted to complete the escape game even without rewards, like grades.
Review Content	COG1	The escape game was an effective method for me to review course content.
Cognitive Overload	COG2	It was difficult for me to focus on learning because I was feeling stressed or overwhelmed.
Learn New Content	COG3	The escape game was an effective method for me to learn new content.
Critical Thinking	COG4	The escape game encouraged me to think critically or analytically.
New Ways of Thinking	COG5	The escape game encouraged me to think about content in new or creative ways.
Collaboration	INT1	The escape game encouraged me to work together to solve problems with my peers.
Communication	INT2	The escape game encouraged me to communicate effectively with my peers.
Likes	OPEN1	About the escape game, I liked…
Dislikes	OPEN2	About the escape game, I disliked…
Suggestions	OPEN3	My suggestions for improving the escape game are…

The criteria for rigor and trustworthiness in qualitative studies are still being contested, but several key themes do seem to be taking shape. One is the importance of credibility, which corresponds to internal validity in quantitative studies (Merriam & Tisdell, 2016, p. 242). The main concern of credibility is whether the research corresponds to reality, but qualitative researchers generally work with an understanding

that reality is multifaceted, dependent on interpretation, changed by observation, and constructed only through inexact symbols. This means that credibility can be considered approximate at best (Merriam & Tisdell, 2016). Still, triangulation is an important and effective way to improve credibility. The final three open-ended questions on the questionnaire provided a more qualitative, written way to gain understanding about student experience, which supplemented the quantitative data.

During the escape games, I observed the students and wrote down my impressions of their behavior. Mertler (2012) would characterize this type of observation as semi-structured, as I also needed to help with the logistical flow of the escape game, and I sometimes shifted my attention from group to group as they communicated and interacted in different ways at different times. Observation as a data collection method is complicated, as observation lends itself to subjectivity, unreliability, and data selection problems (Merriam & Tisdell, 2016). Mertler (2012) writes that observation must be careful and systematic, but that observers should take field notes without strong preconceptions about the nature of the observed behaviors. I made observations of what I saw and heard in a two-column notebook with more objective observations on the left; I later reflected on my observations on the right side of the page (see a blank sample in Appendix B). This allowed me to focus more on observation during the intervention, without yet trying to filter, reflect on, or analyze what I noticed (Mertler, 2012).

Observation allows researchers to view behavior in a more naturalistic context, and to have first-hand experience with the phenomenon under study (Merriam & Tisdell, 2016). Because observation is not recorded or transcribed in as straightforward a manner as verbal interviews, the researcher needs to be very diligent about recording notes while

the intervention is occurring, or as soon as possible afterwards (Merriam & Tisdell, 2016).

A class-wide debriefing after the escape game and questionnaire also provided an opportunity for students to develop ideas, say things that they had difficulty expressing clearly on the questionnaire, and build on each other's suggestions. These debriefings are considered critical for consolidating knowledge and skills developed during escape games (Merriam & Tisdell, 2016). Group interviews or debriefings are especially useful when a researcher is interested in the cognitive processes of participants (Merriam & Tisdell, 2016). Many beliefs, thoughts, or behaviors are unobservable or leave no physical evidence behind – the only way to access them is by directly asking participants (Merriam & Tisdell, 2016). A more structured elicitation of data (like the open-ended questionnaire prompts) allows for the collection of more quantitative, comparable data, while a semi-structured interview (like the debriefings) allows the collection of deeper, richer, and potentially more relevant data (Merriam & Tisdell, 2016). Mertler (2012) writes that semi-structured interviews allow for more flexibility to pursue data threads that I had not originally anticipated. I began the debriefings by asking:

1. What are your immediate impressions of the escape game experience?
2. Expanding on the questionnaire, is there anything you'd like to add about what was successful with the game?
3. Is there anything you'd like to add about what was unsuccessful with the game?
4. Are there any other relevant comments or ideas you'd like to share?

At that point, I followed the discussion wherever it led. I wrote down student responses for later analysis and reflection. Audio recordings were not necessary, as the debriefings served to gather and explore the ideas of students rather than their discourse and modes of interaction.

Observation and debriefings benefit from combination with the examination of artifacts. Ideally, researchers will be able to use all three of the primary collection methods, as they provide different types of information that may corroborate or complicate each other (Merriam & Tisdell, 2016). Therefore, I also analyzed the finished escape games developed by students in the third stage of the intervention. These artifacts provided evidence that students were prompted to practice higher-level thinking skills, like creativity and synthesis, during the project. Merriam and Tisdell (2016) write that "researcher-generated documents" are common and potentially useful in action research, as they provide focused insight into the phenomenon being studied, cut out the noise and extraneous information inherent in other types of artifacts, and open up new ideas and insights for researchers.

Research Procedure

My Honors Economics and AP Government classes provided many opportunities to intervene, reflect on the intervention, redesign the intervention, and intervene again. I engaged each of these classes with an escape game that was relevant to the academic content they were learning. This first round of the intervention occurred during the students' normal 90-minute class time. The four- to five-member student teams, grouped heterogeneously according to ability, attempted to solve different copies of the same escape game simultaneously. Smaller, heterogeneous groups are better for student

achievement according to Marzano (2001). The escape games consisted of an initial puzzle, followed by a set of three puzzles which the students were able to solve in any order. Some games ended after the three puzzles, while others had an additional final puzzle. There was sometimes a one-hour limit on the game. I had students complete a post-intervention feedback sheet with a combination of Likert scale questions and open-ended questions about their experience during the intervention. Unlike Eukel, Frenzel, and Cernusca (2017), I did not include an independent pre- and post-test of content knowledge. Merriam and Tisdell (2016) imply that there may be so many intervening variables (such as variable question difficulty or student decisions to study or not) that affect the data that it may be difficult to draw conclusions.

I did not immediately follow the first stage of the intervention with another escape game, as Marzano (2001) writes that cooperative learning should be used systematically and consistently but should not be overused. Over the following two weeks, I analyzed the results and the feedback from the first round of the intervention. The data from the first stage of the intervention allowed me to adapt both the study and my teaching methods in recursive fashion before the second stage. Based on this data, I designed and administered a second round of the intervention to my various classes. I collected the same type of data from this second round. I also analyzed this data for another two weeks.

Based on the findings from my first and second rounds of the intervention, I assigned a smaller sub-group of students the project of designing an educational escape game for other students. They had two weeks to complete the project. After they had completed their project, I collected and analyzed feedback on their experiences. I also

explored the student-designed escape rooms as artifacts that could demonstrate creative or analytical thinking by students.

Treatment, Processing, and Analysis of Data

The post-intervention questionnaires produced a large amount of data to analyze. Mean values of the Likert responses were tabulated to help answer the research questions. Such measures of central tendency help researchers generalize to the class as a whole and to other populations (Mertler, 2012). I checked for statistical significance using a *t*-test, which is the recommended method for sample populations under 30 (One Sample T Test, 2015). I conducted a *t*-test for each intervention singly and for all six interventions combined as one large data set. The use of the *t*-test also allowed me to compare my findings more readily to those of Eukel, Frenzel, and Cernusca (2017).

The students' open-ended comments on the questionnaire were analyzed both quantitatively and qualitatively. I coded student responses according to the subject discussed. Most of the comments referred to issues of puzzles design (coded as PD), game logistics (L), or particular items on the questionnaire. Those relating to the questionnaire were coded by the abbreviation of their item name. For instance, comments relating to the first affective component of the questionnaire were coded A1, those relating to the third cognitive component were coded C3, and so on. Comments relating to affective issues in general were simply coded A, without a number. Comments relating to some other issue were coded O. These codes, which are included in the data in the Appendix, informed my analysis of the comments by giving me quantitative insight into which areas were most important to students. This allowed my analysis of the qualitative data to be more rigorous and focused (Merriam & Tisdell, 2016).

Merriam and Tisdell (2016) write that qualitative analysis of data such as my students' open-ended comments should be inductive and comparative and should be conducted with a large amount of tolerance for ambiguity. I co-created knowledge with the students by reflecting and building on their ideas, following the constructivist and student-centered tradition (Ertmer & Newby, 1993). The resulting conclusions were integrated into my pedagogical approach in the later stages of the intervention and influenced my search for patterns and relationships as I explored other sources of data. Similarly, the comments and ideas that students contributed during the post-game debriefing were analyzed for interesting connections to or lack of connection to the data from the Likert scale and the observations. Where relevant, resulting conclusions were applied to future escape games in interventions and in my teaching practice more generally.

The semi-structured observations I made during the intervention served as qualitative data as I worked to improve my ability to design and employ effective escape games. I looked for patterns of student interaction and behavior that appeared on the left side of my observation notes. I could then write my reflections about this data on the right column of the notes. Mertler (2012) encourages this type of inductive analysis, especially in the beginning of an action research project, as it allows the researcher to gain a theoretical handle on the study subject. He writes that inductive reflection lets the researcher determine which type of data is important, move past extraneous information, and develop a framework for understanding key ideas and concepts.

A good researcher actively seeks data that complicates or contradicts their expectations, so I also paid attention to behavior that showed an absence or a failure of

strong interpersonal, affective, or cognitive achievement (Mertler, 2012). I interpreted and reflected on the data as Mertler (2012) advises to find relationships and connections between the behaviors and other relevant phenomena. I followed Merriam and Tisdell's (2016) recommendation and moved back and forth between inductive and deductive types of thinking as I reflected on the relationships between the variables. They write that deductive thinking will grow increasingly important as I move towards the "saturation" point at which little new knowledge is being produced (Merriam & Tisdell, 2016). Mertler (2012) writes that I should provide specific examples of relevant student behavior and its relationship to other phenomena, as that increases the transferability and robustness of my analysis. Comparing my reflections to other data ass an important aspect of triangulation (Merriam & Tisdell, 2016). I utilized understanding gained in the early part of this study, when I designed the second and third rounds of the intervention.

The student-produced escape games were investigated to learn what types of thinking the students may have used during the project. I identified the types of thinking that the artifacts show, and coded them according to their best fit in Bloom's Taxonomy (Armstrong, 2017). Observations and reflections on these artifacts were compared to other data produced by the study.

Comparing data gained through questionnaires, observation, interviews, and artifacts helped increase the validity of the findings and opened up new areas of friction or contradiction to explore (Merriam & Tisdell, 2016). This triangulation increased the transferability of my analysis (Merriam & Tisdell, 2016). Since qualitative theory emphasizes the importance of context and the situational aspect of knowledge, transferability places the burden of applying knowledge created on the person trying to

transfer it, rather than on the person who created the knowledge (Merriam & Tisdell, 2016). That is, the original researcher must provide thick description of the original context, and outsiders need to determine whether or to what extent the knowledge applies in this second context (Merriam & Tisdell, 2016). I intended my qualitative data to be rich enough to allow for transferability of effective teaching principles both to my own future teaching and to other classrooms.

Summary

I am intrigued by the idea of integrating escape games into the high school social studies classes I teach, but there is not enough data on whether or how these games can be effective. I proposed to remedy this gap in the literature by exploring how students respond to the playing and designing of educational escape games in terms of their affective, cognitive, and interpersonal development. I worked together with my students in three classes to engage in an escape game during school. Their structured and open-ended responses about their experiences, together with my observation and a class debriefing, provided a mixture of data to reflect on and analyze. My conclusions from this first stage of the intervention helped inform my actions as I designed and implemented the second stage of the intervention several weeks later, in which students engaged in another escape game. Based on further data collection and analysis, I drew conclusions about the proper use of escape games in high school social studies classes. A third stage of the intervention followed, in which a sub-sample of the participants designed escape games for future use in my or other classrooms. These projects were also observed and analyzed as potential evidence for the benefits (or drawbacks) of working with educational escape games.

Chapter 4

Findings

Introduction

In my high school social studies courses, I am constantly searching for better classroom strategies to engage my students, while helping them develop intellectually and personally. I am intrigued by the possibilities presented by educational escape games, but in reality, I do not know the extent to which the possibilities will work out. My problem of practice is the lack of data on whether and how escape games can be useful for education. To help build the data set on educational escape games for myself and other educators and to develop and test ideas about how to use this strategy, I engaged three of my classes with a series of escape game activities. These classes consisted of 11th and 12th grade students in classes of, respectively, 18, 19, and 20 people at a large public high school in a Southern city. Each class engaged in two escape games during class time over a period of one month, and two of the classes then designed their own escape games for use by future students.

I gathered quantitative data from the students after each intervention in the form of a Likert-scale questionnaire to measure their experience of the intervention. I also elicited open-ended feedback through both written responses and group interviews. I also made observations during the interventions. I reflected on the data as it was generated, and my intervention evolved in response to the data and reflections.

The primary theoretical framework for this study is constructivism, in terms of both my motivation and my methods. Constructivists believe that individuals can and should enjoy learning and learn best when they are helping to build knowledge themselves in a meaningful social setting (Schiro, 2013). My use of escape games is a recognition of this constructivist theory of the learner; I want to actively engage students' interests and help them look forward to class. Escape games allow students to collaborate in meaningful ways with their friends and classmates. I wanted to test escape games because they seem to offer a chance for students to learn by creating and synthesizing, rather than just by memorizing and recalling. I thought that escape games, which involve storytelling, props, and authentic choices, might better approximate meaningful learning opportunities than do traditional classroom strategies. In all these ways, my constructivist approach to education impelled me to try escape rooms.

Constructivism is also a useful methodological framework for action research, as the latter is usually collaborative, bottom-up, subjective, and cyclical (Efron & Ravid, 2013). In the constructivist manner, I have treated the experiences and the creations of my student participants as valid contributions to my intervention, and I have engaged in a cycle of data collection, analysis, and adaptation in order to more quickly utilize my students' insights. I analyzed the participants' Likert responses in terms of their means and medians, as these measures allow researchers to generalize to the class as a whole (Mertler, 2012). Following Eukel, Frenzel, and Cernusca (2017), I conducted one-sample *t*-tests on the results of each intervention singly and combined in order to check for statistical significance. I looked for connections and contradictions between the quantitative data and the qualitative feedback gathered from the questionnaire, the

observations, and the interviews; this co-creation of knowledge with my students is an important part of constructivist and student-centered pedagogy (Ertmer & Newby, 1993). This type of bottom-up, inductive analysis is important in action research\practitioners to discover what elements are important, to uncover unexpected relationships, and develop a framework for dealing with emerging areas of scholarship (Mertler, 2012). I did not have the resources or inclination to conduct a large, multi-school study; so in the constructivist tradition, I often relied on my own subjective but informed observations and reflections rather than on a more objective, large data set. The theoretical literature on my problem of practice is lacking, so this constructivist, inductive approach to data collection and analysis helped me fill in some of the gaps.

My research questions were as follows:

1. How do students respond to playing and designing educational escape games in terms of their affective development, including engagement, resilience, and intrinsic motivation?
2. How do students respond to educational escape games in terms of their cognitive development, including content mastery and critical thinking skills?
3. How do students respond to educational escape games in terms of their interpersonal development, including collaboration and communication skills?

In this chapter, I will discuss my intervention as it developed over a six-week period. The discussion will proceed generally in a chronological order, as this will contextualize the emerging data and my cyclical responses to feedback and reflection. At times, however, I will jump out of chronological order when it helps to explore specific themes that emerged during the intervention.

Each intervention will be discussed first in reference to the participant sample. Then, I will present a narrative account of each escape game activity. Where the same escape game is used twice (as in Interventions 2 and 3, and in 5 and 6), I will avoid repetitive descriptions of puzzles and simply note changes to the game. Explanations of the mechanics and gameplay for each intervention will be interspersed with my in-class observations, my post-game reflections, and student statements from the post-intervention questionnaire and verbal interview. Where useful, pictures taken of the escape game will be provided. Students will be referred to by pseudonyms and will not appear in pictures. After narrating each of the interventions, I will provide a table comparing data from them. Then I will reflect on the data generated by the interventions, connecting both quantitative and qualitative data, and focusing on each of the three research questions in turn. The reflections will then help frame a brief analytical discussion of the overall findings of the interventions. Last, I will summarize this chapter and transition to Chapter 5.

Data Presentation and Interpretation

Intervention 1

I conducted Intervention 1 with my Honors Government/Economics class in late April. The class included 18 12th-grade students. Three are African American, 1 is mixed-race, and 14 are White; 9 are female, and 9 are male (Powerschool, 2019). None are English-language learners, and 3 have individual educational plans (Powerschool, 2019). In terms of their GPAs compared to the rest of the senior class, 6 are in the top quintile, 4 are in the second quintile, 3 are in the middle quintile, 3 are in the fourth quintile, and 2 are in the bottom quintile (Powerschool, 2019).

The students put themselves into small groups of 3 to 5 students. Students were allowed up to 45 minutes to complete the game, and they all worked on it at workstations scattered around the room. I developed this escape game myself, and the full game is outlined in Appendix C. The game required students to demonstrate knowledge they had gained from their economics class over the course of the Spring semester.

Each group received a large black box that was secured by a lock that required them to correctly line up five up- or down-arrows (Figure 4.1). They also received the prompt below in an envelope:

> *Let's say movie tickets are a perfectly elastic good. What happens to the equilibrium price of movie tickets in Columbia when:*
>
> - *The government puts a special tax on Netflix.*
> - *A movie comes out that everyone wants to see.*
> - *The government gives a subsidy of $5000 to each movie theater.*
> - *Half of all teenagers go blind.*
> - *The government says all existing theaters have to stay open, but can only sell 20 tickets to each movie screening.*

As students tried to solve the puzzle (and later puzzles), groups looked at each other but did not seem to get answers from each other. I had droning music playing in the room, so teams would not overhear each other say the answers, and this appears to have worked. Groups that were behind especially kept looking at the group that was ahead of them, and it seemed to keep the slower groups motivated. Andi liked "the competitive nature" of the game, and Tom enjoyed "the working in teams."

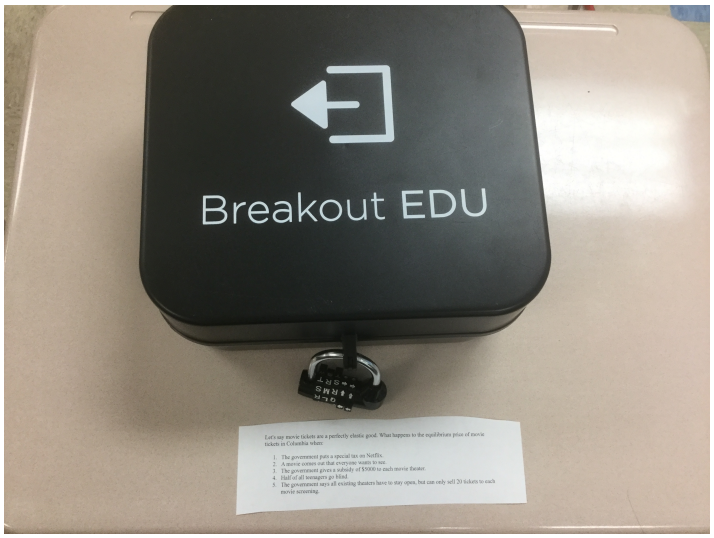

Figure 4.1 A large escape box secured with a 5-arrow lock, next to a puzzle prompt.

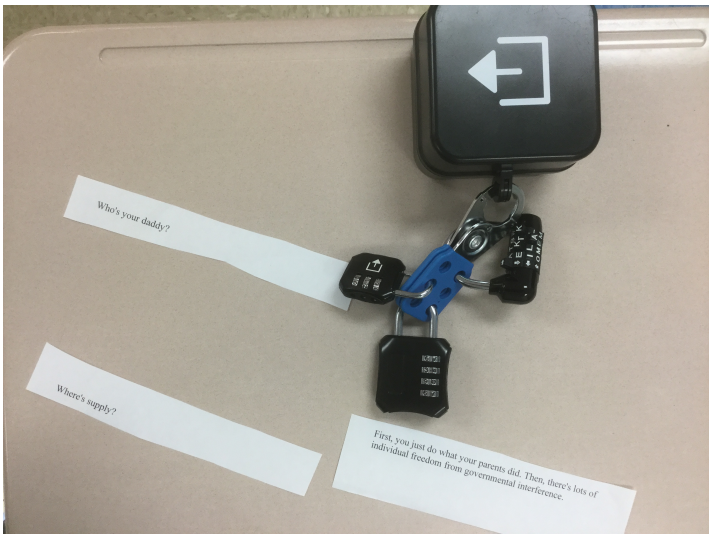

Figure 4.2. A small escape box closed with a hasp, which is secured with a variety of locks. On the desk are puzzle prompts.

After students solved the first puzzle and opened the lock, they found a smaller box inside that was kept shut with a hasp, which itself was kept closed with three separate locks: a 5-letter lock, a 3-number lock, and a 4-number lock (Figure 4.2). There was also a black light flashlight and three pieces of paper. One paper asked, "*Who's your daddy?"*

Written on the back of the paper in invisible ink was the word *HINT* and a drawing of a hand. Students needed to realize that the question wanted them to think of the "Father of Economics" and put in SMITH to the 5-letter lock. Students had some difficulty figuring out this puzzle. Kayla wrote that "the puzzles were confusing," and Stacy said I should "improve the drawing that is a hint." Three others agreed when Jordan said that "we couldn't tell that the invisible hand was that, we thought it was a thumbs up." Poor puzzle construction would end up being one of the most difficult problems throughout the study. According to my coding of the feedback, over half of all negative comments throughout the interventions were related to puzzle design. Far fewer of the positive comments involved puzzle design. Students did seem to enjoy thinking outside the box, however, with Greg writing that "you should do more with the black light."

Another paper inside the large box asked *Where's supply?* Textbooks had been placed around the room, and students needed to take the page number in the textbook that began the chapter on supply and plug it into the 3-number lock. I had not told the students in advance that they might be using their textbooks, and Nylah called this lack of information "confusing because we didn't know that we had to use the textbook." According to my coding of the comments, logistical problems like this were the second-most common cause of negative feedback. When students became frustrated, some of them would disengage from the activity. There seemed to be no difference in engagement in terms of race/ethnicity, though the girls seemed somewhat less engaged than the boys. I am not sure why the gender imbalance was there. Perhaps the boys are more experienced in games. It could also have been due to the nature of this specific class, in which the girls generally had been the more attentive students all year. The boys, who

often did not complete their homework or readings, may have benefited from the alternate way of showing or developing their mastery of content. Some students just do not respond to learning from books and need more active engagement. Gabe wrote that he liked "trying new ways of learning." One of my students with an individual learning plan especially outperformed his usual level, and many students said, "I liked it a lot."

Though some students checked their cell phones during the intervention, they did so much less frequently than in a normal class. This seemed like a strong signal of engagement, maybe even more persuasive than Likert responses that the students gave about engagement. Tya wrote that she enjoyed "being engaged." However, there were several logistical problems that may have decreased engagement and achievement. One group had the right answer for fifteen minutes but did not know how to open the lock. Anne wrote that "you should tell us how to open the locks." I had incorrectly just assumed that everyone would know how to deal with the locks.

I also did not realize the group was stuck on that problem at the time. I had not wanted to observe groups overly closely because I thought the freedom to fail and the idea that students have agency was an important aspect of the escape game. Another group almost solved a puzzle that depended on finding the particular textbook page number, but they were on a similar page right next to the one they needed. This also indicated that I needed to do a better job of explaining logistical issues. I had wanted students to solve the puzzles using only those clues that I had built into the game, but Phil was not alone when he said, "we need more hints." During this game, I only gave students a verbal hint on solving a puzzle if I sensed that they were on the verge of giving up.

The final piece of paper in the large box said, *"First, you just do what your parents did. Then, there's lots of individual freedom from governmental interference."* Students needed to find the numbers of the textbook pages that describe traditional economies and market economies, and then enter them (3945) into the 4-digit lock. Groups who solved the 3-digit puzzle first found it easier to solve this puzzle, and some students especially like this type of puzzle. Manny wrote that "the clue that used the page numbers in the textbook was a good idea."

Some groups developed a form of cooperation that involved strict and separate divisions of tasks, and other groups' members traded roles frequently and worked more together. It was not clear that either approach was necessarily better for solving the game. In the future I could give more guidance to students on how to divvy up roles, but I think it is also important for them to figure it out as they go along. As the Likert scale data would show, collaboration and communication within groups was one aspect of the intervention that saw quite positive results. This claim was supported by the coding of student comments, which related to cooperation (INT1) in a positive way more frequently than to any other questionnaire item.

Some but not all groups opened all three locks on the hasp and were able to open the small box. Inside, they found a letter of congratulations at solving the puzzles and some candy as a reward. As students were attempting to solve the game, I wrote my observations of what was happening in the room. Shortly after, I reflected on those observations. My full observations and reflections are presented in Appendix D, and some of them are interspersed with the above narrative of Intervention 1.

After we finished the game, I gave students a written questionnaire to gather feedback about the experience. They responded to 11 statements using a 5-point Likert scale with a range from 1 (strongly disagree) to 5 (strongly agree). Where multiple students gave similar responses on the open-ended portion, the number of these responses is put in parentheses. After collecting the questionnaires, I also conducted a brief semi-structured group interview with the class to follow up on or unearth any important feedback. The quantitative results of the questionnaire are presented later in this chapter, and entirety of the feedback from the questionnaire and the interview are presented in Appendix E. Some of the qualitative feedback also appears in the above narrative.

Intervention 2

I conducted Intervention 2 with my 3A AP American Government and Politics class in early May. That class included 20 11th grade students. Two are African American, 3 are Asian American, and 15 are White; 14 are female, and 6 are male (Powerschool, 2019). Three are English-language learners, and none have individual educational plans (Powerschool, 2019). In terms of their GPAs compared to the rest of the junior class, 13 are in the top quintile, 6 are in the second quintile, 1 is in the middle quintile, 0 are in the fourth quintile, and 0 are in the bottom quintile (Powerschool, 2019).

I randomly assigned students membership in small groups of 4 or 5. Students were given up to 50 minutes to finish the game, and they worked at various stations set up throughout the room. I adapted this escape game from one designed by Wendy Rouse and available on the Breakout EDU website (Rouse, n.d.). The full game is presented in Appendix F. The game required students to demonstrate skills and knowledge they had gained from their government and history courses over their 11th grade year. As with

Intervention 1, I gathered data on the escape game in the forms of my observations, my reflections, a student quantitative survey, open-ended student written feedback, and a semi-structured group interview. Some of these data appear throughout this section, and all of it can be found in Appendix G and Appendix H.

To begin the game, I read aloud to students a scenario involving their history teacher, Mr. Davis, who "is plotting to go back in time and change the course of history so that he will be the supreme ruler of the world... Mr. Davis has designed intricate puzzles to keep you from finding his secrets... He loves history and is especially obsessed with historical thinking skills such as sourcing and contextualization. You will have to use your historical thinking skills to out mastermind Mr. Davis." They seemed positively engaged by the idea that they would use their history skills to outwit their history teacher.

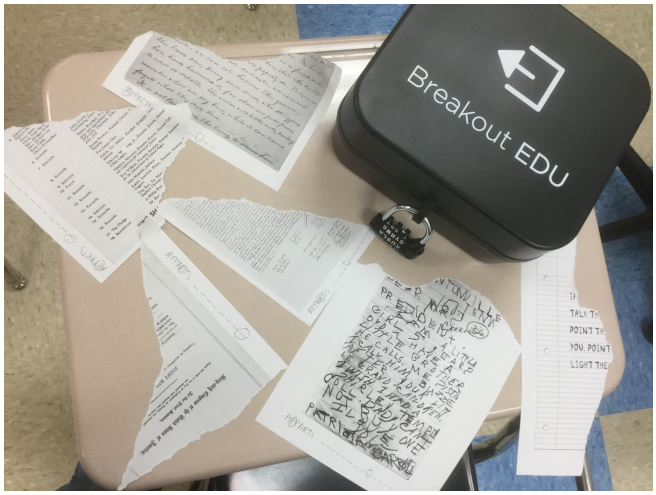

Figure 4.3. A large escape box secured with a 5-letter lock. On the desk are scraps of documents that must be contextualized.

Each group received a large black box with a 5-letter lock that required them to arrange the letters in order (Figure 4.3). On top of each box was a large envelope with a sheet of paper reminding them of the "APPARTS" approach to contextualizing a document by considering its author, place/time, prior knowledge, audience, reason, the

main idea, and significance. Also in the envelope were five torn sheets of paper that showed partial copies of documents relating to the Great Depression, the March on Washington, the Gettysburg Address, the 19th Amendment, and the Declaration of Independence. Once students correctly identified the context of each document, they could use one letter from each context to form the word "POWER," which was the solution to the 5-letter lock.

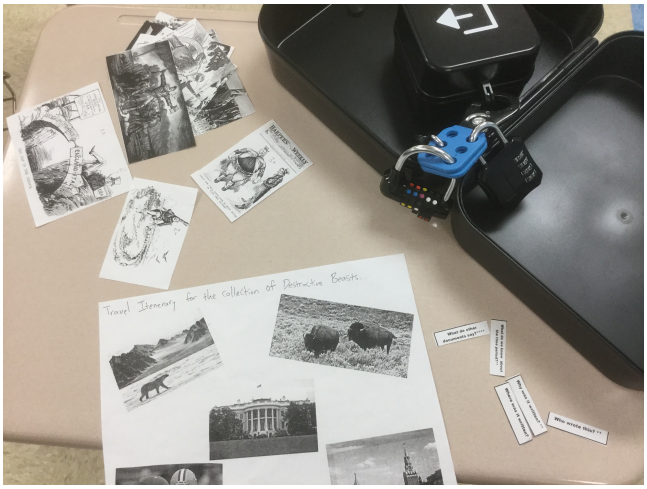

Figure 4.4. A small escape box closed with a hasp, which is secured with three additional locks. On the desk are puzzles prompts.

Of all the puzzles in all of the interventions, students gave this puzzle the most positive feedback, broadly agreeing that "the first puzzle was the best because it was a mix of analysis and content knowledge." This puzzle had lots of different sub-puzzles that let students devise their own ways of working together. It rewarded sustained attention to textual clues, and students enjoyed "how the little details came together," as well as "the gamification of history." Sam wrote that they "probably couldn't learn new content, but it's good for review," and both the numerical feedback and the coding of student comments toward this puzzle supports the idea that it was well-designed.

As students attempted to solve this and later puzzles, the music kept stopping while students were talking, which meant other teams sometimes overheard them. I realized I need to find better sources of music, which can reflect the theme of the game while still keeping teams from overhearing each other. I picked teams randomly, and one team was entirely made up of students who saw themselves as less academically inclined. This group self-sabotaged and gave up easily, while other groups showed more resilience. This mixed result for student resilience is reflected in the ambivalence of some feedback. Davis wrote that "the teamwork was fun" and Saul especially liked "competing with other teams." At the same time, Khris asked that I "let us pick teams" and "try different group sizes." I think more balanced, conscious construction of student groups could improve overall resilience. Positive comments on affective results far outnumbered negative comments.

After students solved the 5-letter lock and opened the box, they found a smaller box inside that was closed with a hasp, which was itself kept closed with three additional locks: a 5-color lock, a 3-number lock, and a 4-number lock (Figure 4.4). Also inside the big box were: a black light flashlight; a paper that advises the students in methods of map reading, reading like a historian, and chronological thinking; also, there was a piece of paper titled "Travel Itinerary for the Collection of Destructive Beasts" with unlabeled pictures of the Green Bay Packers, the White House, Red Square, Yellowstone Park, and Greenland. When students shined the black light on the paper, the order of the pictures is revealed in invisible ink. They could then open the 5-color lock once they identified the pictures.

Many groups had difficulty with this puzzle, with Ali writing that "we needed a better hint for the color-lock puzzle." When I noticed groups struggling for a long time, I would give them verbal hints, but these did not always work. In some cases, the hint system turned into a verbal negotiation where students kept trying to pull more hints out of me without thinking about what I had just said. This made me realize that I needed to improve my method of dispensing hints, perhaps by having written hints in advance, that I can give out at certain times. At the same time, Lola reported "satisfaction and fulfillment when my team completed a puzzle," and Mal appreciated that "it was challenging and made you think." I also observed that students were very happy when they solved a lock they had been working on for a long time, and this speaks in favor of letting students struggle for a while without intervening.

I had expected the 3-number lock puzzle to be interesting but relatively easy for students, but it turned out to be the reverse. Inside the big box students also found a loose, unordered stack of pictures depicting historical events. Each picture had part of a mathematical equation on it. The pictures had be sorted into the three eras they came from: the Civil War Era, pre-World War I American foreign policy, and the Civil Rights Era. Then the pictures had to be chronologically ordered. The correct order allowed students to tally the three different equations, yielding three digits for the lock. Many agreed with Tim, who wrote that "the puzzle that required math was too confusing and had way too many pictures" and "instructions were too vague." Gabi wrote that "the pre-required content needed should be more general, with fewer specifics like dates." In response to the feedback, I improved the clarity of the instructions and removed several

pictures from this puzzle. There is a balance for puzzles between being too hard and too easy, and I had not found it yet.

There seemed to be another type of frustration and struggle when students had problems with game logistics. Hilda wrote that "it would be more intuitive if some of the puzzles had fewer potential right answers," which indicates games should be play-tested before they are given to a class as a whole. Some students had problems figuring out the locks, even though they had already solved the puzzles. Micah said, "The lock didn't work with the right code." As this occurred even with the more driven and academically impressive students, I needed to explain the workings of the locks even more in advance than I already did.

To solve the 4-number lock, students had to read another paper inside the big box that divided various elements of "Reading Like a Historian" into four different skills: Sourcing, Contextualization, Corroboration, and Close Reading. Ten different questions that belong to the different classes of skills were also in the big box, cut into small slips. Some of the slips had a particular number of asterisks on them. Students needed to sort the questions into the four classes of skills, and then the numbers of asterisks in each class of skill indicated the four digits that open the lock. This did not pose a great problem for any of the groups, and several students wrote that it was a "fun way to review."

If groups managed to open all three locks on the hasp, and thus open the small box, they found the second part of a letter that they had already received half of, as well as a group hall pass to their English teacher's room. The letter, when completed, reads: "*If the walls could talk the past would point the way back to you. Point back and light the*

way." Students had to go to their English teacher's room, where a number of historical portraits (with people pointing) were taped to the walls. When they shined the black light on the portraits, the fingers pointed to one letter each. When unscrambled, the letters read "CARLETON." There was a banner from that college (my alma mater) back in my classroom, and the failsafe key was taped to the back of it. They could use the failsafe key to open yet another box at the front of my room. Inside that box was a letter of congratulations at saving the world and some candy as a reward.

None of the groups, however, managed to decode this final clue in time. Some students kept asking how much time they had, which indicates I needed to get a countdown clock, so they can pace themselves. Several of the students mentioned "stress" as an aspect of the game they disliked, and I think the ability to self-pace could help alleviate the bad stress. Though no group had enough time to complete the game, I do not think it is a good idea for the games to be too easy – there should be a legitimate risk of not winning. But since no team completed the game in time, I decided to give the next group more time.

Intervention 3

I conducted Intervention 3 with my 3B AP American Government and Politics class in early May. That class included 19 11th grade students. One is African American, and 18 are White; 14 are female, and 5 are male (Powerschool, 2019). None are English-language learners, and none have individual educational plans (Powerschool, 2019). In terms of their GPAs compared to the rest of the junior class, 15 are in the top quintile, 3 are in the second quintile, 0 are in the middle quintile, 1 is in the fourth quintile, and 0 are in the bottom quintile (Powerschool, 2019).

I used the same Historical Mastermind escape game as in Intervention 2, although I made some changes based on the feedback from that intervention. I assigned students membership in groups of 4 or 5, purposefully including in each group students of various academic abilities. Students were given 70 minutes to finish the game. Some of the data from this intervention appear throughout this section, and all of it can be found in Appendix I and Appendix J.

As in Intervention 2, students rated the first (5-letter lock) puzzle highest, with Karl saying that "the first puzzle was the best because it was a mix of analysis and content knowledge." I reflected that a good puzzle is not too hard and gives everyone something to do. It gets the game started on the right foot. I also observed that none of the groups gave up, even if they had not made progress in a while. Students wrote that "the teamwork was fun" and that they liked "competing with other groups." For a competitive classroom activity, balanced groupings seem to be very important.

I included more directions for the 5-color lock. This puzzle was still not especially demanding in terms of content knowledge or historians' skills. This might be the type of puzzle that is more useful for creating engagement, but less useful for advancing course content. As Niki wrote, "I liked the color lock, but not the puzzles that required pre-existing knowledge."

I switched away from a system of verbal hints for frustrated students and gave students a paper copy of hints designed to get them closer to an answer without giving it away. For the first puzzle, for instance, I gave struggling groups a slip that said:

5-letter lock hint:

- *Where did you have a dream?*

- *What did Jefferson want?*
- *Back when nobody could afford a Shirley Temple doll.*
- *The guy could sure give an address.*
- *This one goes out to all the ladies.*

Feedback was mixed about this approach. It seemed to work better, based on my observations, but Tasha wrote, "The hints worked okay, but rather than giving us vague hints about all aspects of the puzzle, you should straight-up tell us part of the answer so we understand how to solve the other parts."

The 3-number lock, involving arranging pictures chronologically and solving equations, was quite unpopular. Even though I tried to improve the directions, many students agreed with Gustav's statement that "the math part was too confusing." This puzzle was mentioned negatively many times in the questionnaire, even though I also removed a number of the pictures to make it easier. I might need to find another way to challenge students on chronology.

As before, the 4-number lock was not very challenging. Three of the five groups managed to reach the final puzzle in the English teacher's room, though none of them solved it. Students showed ownership over their inability to solve the final puzzle, with Marcus saying that "we wanted more time, because we didn't manage it well since we didn't know how many puzzles there would be." This was coupled with satisfaction at the process and outcome. Many students agreed when Dean said, "It was good and suspenseful not to know how many boxes we were going to have to unlock." All in all, the extra 20 minutes that students had to complete the game seemed to decrease stress, and the better instructions decreased frustration. Students were also especially engaged

by the surprise trip to their English teacher's room "because it made it like a scavenger hunt." Surprises and movement seem important aspects of student engagement. A goal will be to build these into future games without becoming predictable.

Intervention 4

I conducted Intervention 4 with my Honors Government/Economics class in mid-May. I adapted this escape game from one designed by Karen Albert and posted on the Breakout EDU website (Albert, n.d.). The adapted game is outlined in Appendix K. I allowed students to form their own groups of 4 or 5. I reverted to student-chosen groups because these students were 12th graders only a few weeks away from graduation, and I could sense they were only going to engage with schoolwork if it suited them. Students were given 60 minutes to finish the game. Some of the data from this intervention appear throughout this section, and all of it can be found in Appendix L and Appendix M.

To begin the escape game, I read students the following premise: "*Lions, Tigers, Bulls and Bears, Oh My! Lions, Tigers, Bulls and Bears, Oh My! Bulls or Bears are taking over Wall Street. We need your help to save the market from losing all its value and sending the economy into a tornado tailspin. Can you help the Wizard stop the market from crashing, like a house on the wicked witch?"*

Each group received a large box secured with a 3-number lock (Figure 4.5). They also received an envelope containing a series of questions they were to answer using the internet, such as "*According to Investopedia, how many Bear markets have we experienced since 1926?"* Based on their answers they would be able to solve an equation that provided the combination for the lock. For the most part, this puzzle received positive feedback ("liked it," "good and short," "perfect"). Because there were

multiple, independent sub-puzzles, it seems that it allowed students to develop a pattern of cooperative problem solving.

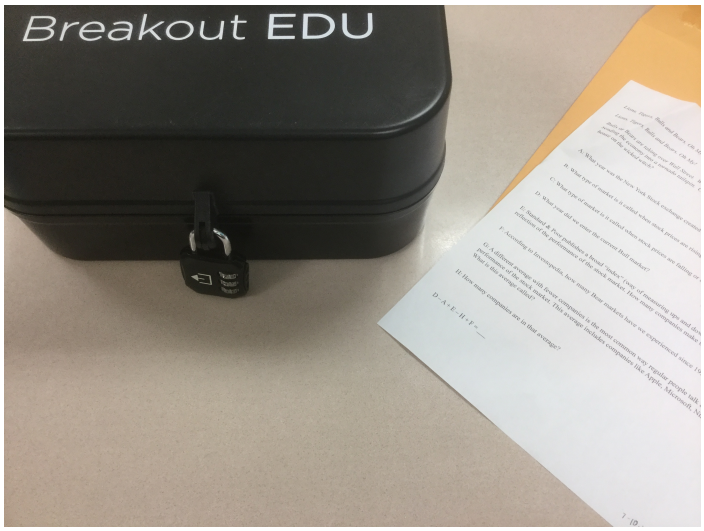

Figure 4.5. A large escape box secured with a 3-number lock, next to a puzzle prompt.

Figure 4.6. A small escape box closed with a hasp, which is secured with a variety of locks. On the desk are three puzzle prompts.

Once students opened the first lock, they found a smaller box with a hasp secured by a 5-arrow lock, a 4-number lock, and a 5-letter lock (Figure 4.6). They also found a

piece of paper that asked whether share values of Facebook, Apple, Nike, Zynga, and Berkshire Hathaway had gone up or down over a particular time period. Students were able to use their phones to research the changes, and the results allowed them to open the 5-arrow lock. This puzzle received mixed feedback, with Mary Bell calling it "extremely confusing," but Ringo calling it a "good learning technique." Based on my own observations and verbal feedback, students were fairly engaged, with Andrew saying "it was fun to use my phone."

Inside the big box students also found a black light flashlight and a photo of an impossibly long bull. The bull had a speech bubble that read "Says FINRA," and the photo was cut into twenty puzzle pieces. On the back of the photo in invisible ink was the question "How many days?" Some students quickly solved this puzzle by going to FINRA's website, learning that the longest bull market ever lasted 4494 days, and putting 4494 into the 4-number lock. Other students struggled, and I gave them verbal hints to help them. Willa wrote that the puzzle was "pretty tricky," and Oona said that it was "hard to understand what we should do." The students who were most frustrated by this puzzle were, perhaps surprisingly, mostly students who do very well in class. At the same time, they had often seemed more motivated by getting good grades than by learning content. Thus this puzzle offered a similar takeaway as did Intervention 1: escape games are not likely to be as engaging for students who are just trying to move through course content quickly and professionally. Thinking outside the box is not something they aspire to during school hours. As Becky wrote, "this was no fun at all."

In the large box students also received a piece of paper with a QR code, which led them to a video of various stock markets closing for the day. The only sound in the video

was the chiming of the closing bells, and students could solve this puzzle by putting BELLS into the 5-letter lock. Students responded quite favorably to this puzzle, with Monique calling it "good because it was so obvious that it was hard to get." At the same time, the puzzle did not really offer a chance to review or learn class content; it was more a non-academic riddle that was set in the context of the economic world we studied. As Gary wrote, puzzles like this, which show decent ability to engage students, should be adapted to be "more related to class content."

When groups answered the puzzles and were able to remove the hasp from the small box, they found a letter of congratulations and some candy as a reward. Most of the groups were able to complete the game.

Intervention 5

I conducted Intervention 5 with my 3A AP American Government and Politics class in late May. I designed this escape game myself, inspired by a number of games available online (Breakout EDU, n.d.). The game is fully outlined in Appendix N. I assigned students membership in groups of 4 or 5, purposefully including in each group students of various academic abilities. Students were given 60 minutes to finish the game. Some of these data from this intervention appear throughout this section, and all of it can be found in Appendix O and Appendix P.

At the start of the escape game, students were told that their AP Government test scores had been cancelled, and the only way to reinstate them was to solve a series of puzzles that protected the central AP database. In an envelope, students also got a black light flashlight and one sheet of paper that featured excerpts from each of the seven articles of the Constitution (Figure 4.7). They had to identify the number of the article for

each excerpt and then solve the resulting math problem that would be revealed by the flashlight. This would open a 4-number lock that secured a large box. This puzzle seemed to work well, with Amy writing that it "challenged us to think" and Tex saying that it "helped me understand the concept."

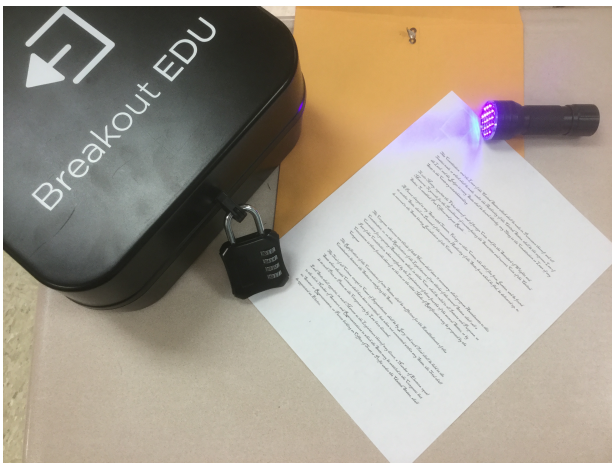

Figure 4.7. A large escape box secured with a 4-number lock. On the desk are a black flashlight and a puzzle prompt.

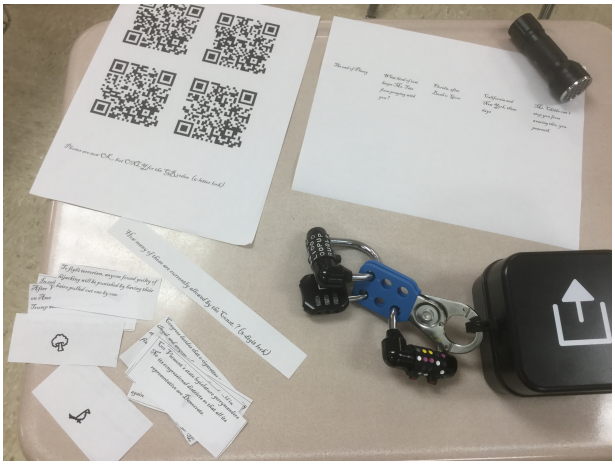

Figure 4.8. A small escape box closed with a hasp, which is secured with a variety of locks. On the desk are puzzle prompts.

Once students opened the large box, they found a smaller box secured with a hasp, which in turn was secured by a 5-color lock, a 3-number lock, and a 5-letter lock (Figure 4.8). They found a sheet of paper giving them a series of Supreme Court-related prompts that hinted at a color. For instance, students who remembered the case of *Plessy v. Ferguson* would know that the prompt "The end of *Plessy*" hinted at the color brown (as in *Brown v. Board of Education*, which essentially reversed the Court's decision in *Plessy*). Once students deduced all five colors, they could open the 5-color lock. This puzzle posed no great challenge. Eleven students wrote that it was "good" or "great," and four wrote that it was "too easy."

Also inside the large box was a piece of paper with "How many of these are currently allowed by the Constitution?" written on it. There were also 12 small pieces of paper, each of which had a political scenario written on it, such as "The President pardons his son for drug trafficking." On the back of each of these papers was a rune. There was also a sheet of paper that identified each rune as representing a letter of the alphabet. Students had to identify which of the 12 scenarios were constitutional, then translate the 4 constitutional runes into letters, then arrange the letters into the abbreviation "Sens." Since they know there are 100 Senators, they could open the 3-number lock by turning it to 100.

This puzzle was very difficult for students to solve. Many wrote that it was "too hard and confusing," and Jada wrote that it "would have been better if I had understood it more." I observed that many groups did not know which puzzles belonged to which locks, and this puzzle was the most confusing one in that regard. I had thought, during game design, that the puzzles were clever in their misdirection. But four students wrote a

variation of "make it clear which puzzles and locks are connected," and seven said I needed to "make instructions more clear." Not knowing which puzzle goes with which lock is frustrating and unproductive for a student.

Also inside the large box were four pieces of paper that had QR codes on them. When students took pictures of the codes with their phones, they were taken to four short videos: from the movie Animal House, the video game Legend of Zelda, the song Do Run Run, and a punk song called Federalist 10. All the videos hint at the idea of political parties. (Animal House features a lot of parties, the hero of Zelda is named Link and parties are linkage institutions, parties run candidates in elections, and Federalist 10 concerns the role of factions, the most important of which might be political parties.) Thus, students could open the 5-letter lock with the word PARTY. Many students wrote that this puzzle was "too hard" or that they "didn't know what to do." Some appreciated the opportunity for critical thinking, though Max suggested that I "do things people actually know and not Zelda." In retrospect, this puzzle might have been too hard for teenagers, whose cultural references are two decades more recent than mine.

If students had managed to unlock all three of the locks on the hasp, they would have found a letter of congratulations at fixing their AP scores and some candy as a reward. However, none of the groups opened all three locks, even though I extended the amount of time I gave them. This meant that we did not have time to conduct a verbal interview after this intervention.

Intervention 6

I conducted Intervention 6 with my 3B AP American Government and Politics class in late May. I used the same Constitution escape game as in Intervention 5, although

I made some changes based on the feedback from that intervention. I assigned students membership in groups of 4 or 5, purposefully including in each group students of various academic abilities. Students were given 60 minutes to finish the game, and I put a countdown timer on my whiteboard so they could see how much time they had left. Some of the data from this intervention appear throughout this section, and all of it can be found in Appendix Q and Appendix R.

To begin the game, students worked on the 4-number puzzle. I slightly clarified the directions for this puzzle, and eight students reported that the puzzle was "good." Only a few students seem to be confused by the instructions. After so many students were frustrated in Intervention 5, I made the written hints more comprehensive in this iteration. I also told students they could get hints only after they had spent 15 minutes on a puzzle, but that it would take them out of contention for the grand prize. Carla later asked me to "give each group some hints that they can use whenever," but my observations pointed me in the opposite direction. During the game itself students seemed to complain less frequently than before about getting hints, as they knew they could only get them at particular times, and that it would cost them compared to other teams.

The 5-color puzzle was "good" (according to eight students), "my favorite" (two students), "easy" (four students), and "too easy" (two students). I would not want to make all the puzzles of an escape game this easy, but it did seem important for student engagement to be able to solve at least one puzzle without getting bogged down. As Mina said, "it feels rewarding when you solve a puzzle." A good escape game likely contains puzzles of varying difficulty.

I altered the 3-number puzzle, by changing the prompt to "How many of these are currently allowed by the Const.?" I thought the abbreviation would allow students to more easily realize that another abbreviation was involved in solving the puzzle. Also, I made it clear which puzzle went with which lock, which had confused many groups in Intervention 5. Students seemed less frustrated by vagueness about which puzzle went with which lock, and three students reported that this puzzle was now "very good," but a large majority of the students still found this puzzle "too hard and confusing" or "unclear."

The 5-letter lock puzzle became even less appreciated by these students. Nessie wrote that "it was a huge stretch," and Val "didn't know what to do." Many had to request a hint for this puzzle. While students were working, I observed that the timer seemed to be helping them focus, despite the fact that Cristiano said, "Don't put the timer on the board." The small stress of having a visible timer seemed beneficial. Several groups solved all four puzzles and were able to open the final box.

Intervention 7

I conducted Intervention 7 with my 3A and my 3B AP American Government and Politics classes from late May through early June. In groups of 3-5 of their own choosing, students designed their own escape games for use by history and government students in future years. Students received copies of an assortment of articles about educational escape game design and Bloom's taxonomy. They had a minimum of four class periods to design and submit their escape games. The student-made escape games were analyzed, using Bloom's Taxonomy as a basis, to determine the kind of thinking that went into their design. The results of the analysis indicated that students were demonstrating thought on

the “creating” level of Bloom's Taxonomy (Armstrong, 2017). However, this result was unsurprising and monotonous, and I eventually realized that this intervention was a poor fit with the rest of my study. Students completed it in and out of class over the course of a week or more, and its demands were of a different nature than those of the first six interventions, so the data generated was of a different nature. Furthermore, the intervention was more indebted to theorists of project-based learning than to theorists of educational games like Nicholson. Since there was uncertain overlap between Intervention 7 and the rest in terms of either methodology or theory, it will not be explored further in this action research study.

Table 4.1

Comparative Mean Results for all Six Interventions and the Overall Mean

Dimension	**Item**	**1**	**2**	**3**	**4**	**5**	**6**	**All**
Engagement	AFF1	4.6	4.5	4.91	4.29	3.85	4.39	4.37
Distraction	AFF2	2.45*	2.7*	2.73*	2.57*	3.25*	3.29*	2.88*
Resilience	AFF3	4.18	4.05	4.45	3.36*	3.25*	3.83	3.8
Intrinsic Motivation	AFF4	4	3.89	4.36	3.57*	3.45*	4.06	3.85
Review Content	COG1	4.45	3.7	4.18	3.71	3.1*	3.78	3.73
Cognitive Overload	COG2	2.09*	2.9*	1.82*	2.71*	3.6*	2.83*	2.79*
Learn New Content	COG3	4.09	3.3*	3.45*	3.86	3*	2.94*	3.36
Critical Thinking	COG4	4.55	4.45	4.55	4.57	3.9	4.33	4.35
New Ways of Thinking	COG5	4.45	4.45	4.45	4.5	4	4.28	4.33
Collaboration	INT1	4.55	4.63	4.82	4.64	4.3	4.61	4.57
Communication	INT2	4.55	4.6	4.82	4.57	4.32	4.44	4.53

General Findings/Results

For each dimension, students rated the extent to which the escape game effectively promoted that attribute. Note that for AFF2 and COG2, students rated the

extent to which the games decreased learning due to distraction and cognitive overload, respectively. Table 4.1 provides a comparative look at the mean results on each quantitative item in the questionnaire. It also contains the overall mean for each item. I wanted my results to be easily comparable with those of Eukel, Frenzel, and Cernusca (2017), so where possible I followed their method of quantitative data analysis. A one-sample t-test was conducted for responses on each item for each intervention, as well as for the combined responses over all interventions for each item (One Sample T Test, 2015). Students' mean perceptions showed significant departures from the mean value of the evaluation scale, which was 3, or "Neutral." The two-tailed critical t-value for all responses was statistically significant (at an alpha level of 0.05), except for the results marked by an asterisk in Table 4.1 (Lane, n.d.).

Analysis of Data Based on Research Questions

Unless stated otherwise, all references to quantitative feedback refers to the mean score of the Item (AFF1, COG4, etc.) in question. Measures that are not statistically significant at an alpha value of 0.05 are marked with an asterisk.

Research Question 1

How do students respond to playing and designing educational escape games in terms of their affective development, including engagement, resilience, and intrinsic motivation?

In Intervention 1 feedback on affective measures was quite positive. Mean engagement was high (4.6), though there was room to improve, so I will add a backstory to future escape games. Mean Resilience (4.18) and Intrinsic Motivation (4) were both high. Three of the five groups finished the game in the allotted time. However, open-

ended responses such as “the puzzles should be better constructed” point to much frustration at problems with game mechanics. Consequently, I attempted to explain locks more and make puzzles less confusing for future interventions.

In Intervention 2, engagement (4.5), distraction (2.7*), resilience (4.05), and intrinsic motivation (3.89) were all still encouraging, but also all worse than in Intervention 1. Much of the open-ended feedback supports the idea that the puzzles were frustratingly confusing; for example, one group said “instructions were too vague.” I adapted the puzzles to reflect this feedback before Intervention 3, especially the 3-number lock puzzle that required math. I also determined to make sure each group had a balance of higher- and lower-achieving students, so that no single group was more tempted to give up. I also moved to formalize the system of giving hints to groups that were stuck, by making them written rather than verbal, and only available to groups after a certain amount of time had elapsed.

Intervention 3 saw large increases over Intervention 2 in resilience (4.45) and intrinsic motivation (4.36). This indicates that better designed puzzles and hints with clearer directions are important for students’ affective gains. There were still some complaints about vague or confusing aspects of the game, but fewer than in the previous interventions. Students reported feeling highly engaged by the suspenseful aspects of the game and by the change of scenery to another classroom for the final puzzle. I want to keep improving engagement by making puzzles less confusing – to that end I expanded the open-ended part of the questionnaire to allow students to provide feedback on the individual puzzles.

In Intervention 4, engagement (4.29) was measured as fairly high, resilience (3.36*) and intrinsic motivation (3.57*) were relatively low. My observations and the open-ended feedback support the idea that some students had a very positive affective response to the escape game, while others were quite negative: “Suggestion: not to do it.” I reverted to informal, verbal hints during this escape game, and I think that may have contributed to some students feeling overwhelmed because they forgot the hints soon after hearing them. Student feedback on the quality and difficulty of individual puzzles was often ambivalent, with most of the puzzles being called both easy and hard.

Affective feedback for Intervention 5 was worse across the board, compared to this class' previous escape game. While it was still somewhat engaging (3.85), students reported much less resilience (3.25*) and intrinsic motivation (3.45*). The element of distraction, which in all previous interventions was negligible, rose to a mean of 3.25*. Though much of this feedback was not statistically significant at an alpha value of 0.05, I think the worsening is due to confusing puzzles and vague or non-existent directions. After this intervention I tried to make these directions much clearer. I also began putting a countdown timer for one hour at the front of the classroom in response to student requests and in an attempt to increase a sense of healthy tension.

In Intervention 6, students reported more engagement (4.39), resilience (3.83), and intrinsic motivation (4.06) than in Intervention 5, so I think my attempt to make the puzzles less confusing was somewhat successful. In open-ended feedback, there was still a decent amount of frustration over difficulty and confusion though. This game may not have been as well designed as the game used by this class previously. The 5-letter lock puzzle, which relied on students guessing a common theme between a number of online

videos, was especially frustrating for students. There might be a generation divide between the references I think are common sense (Animal House or Legend of Zelda) and those that speak to my students. This indicates a need for more pre-testing of the games.

A number of key patterns and themes emerged from the findings of the interventions. The results pertaining to Research Question 1 were fairly positive. Engagement (overall mean of 4.37), resilience (3.8), and intrinsic motivation (3.85) were all positive. Coding and analysis of student comments mostly supports the numerical data, as students spoke much more frequently of being engaged than they did of being disengaged. Likewise, more students referred to feeling motivated than to giving up. Interestingly, each of these items dropped for every class during their second intervention. This may reflect a loss of interest due to the lack of novelty, in which case teachers would be recommended to wait a longer time period after using an escape game before returning to the activity. It could also reflect an unrelated disengagement with school as summer grew closer.

However, there is some evidence that indicates the loss of affective benefit was due to poor game design by me. Measurements of perceived distraction were not statistically significant for the interventions singly or combined, but there is still an interesting pattern of results. The measure of distraction (AFF2) should (all other things equal) decrease when a class participates in its second intervention, as they are more prepared for the unusual demands of an escape game. However, each class group showed an increase in distraction from their first to their second escape game (2.45* to 2.57*,

2.7* to 3.25*, and 2.73* to 3.29*). This unexpected result indicates that my own poor game design may have been a factor in the weakening of affective benefits over time.

Research Question 2

How do students respond to educational escape games in terms of their cognitive development, including content mastery and critical thinking skills?

Intervention 1 was more effective as a review of content (4.45) than as an introduction to new content (4.09). Students reported that the game encouraged critical thinking (4.55) and new ways of thinking (4.55). The puzzles generally did not produce cognitive overload (2.09*).

In Intervention 2, feedback on reviewing old content (3.7) and learning new content (3.3*) both were lower than for the students in Intervention 1. These students had covered this content months beforehand in their history class and had not reviewed it recently. This indicates that escape games may be better for reviewing more recently covered material than for older material. Scores for critical and creative thinking (both 4.45) were high. Students responded especially positively to the first, 5-letter lock puzzle. This puzzle involved using historical thinking methods that they had repeatedly practiced in class, with less of an emphasis on problem-solving skills that they had not practiced.

In Intervention 3, the escape game remained relatively ineffective at teaching students new information (3.45*). However, reviewing older content (4.18) and especially critical (4.55) and creative (4.45) thinking were supported by the escape game approach.

In Intervention 4, the previous pattern for cognitive effects continued, as students reported lower satisfaction with the escape game for content review (3.71) and learning

new content (3.86), but higher satisfaction with opportunities to think critically (4.57) or creatively (4.5).

In Intervention 5, feedback on cognitive dimensions was relatively negative, and often not statistically significant. Neither review content (3.1*) nor new content (3*) were effectively conveyed. Cognitive overload (3.6*) became a problem for the first time, again likely because of the poor puzzle design. Even the previous cognitive strengths of the escape game strategy, critical thinking (3.9) and creative thinking (4) suffered compared to previous interventions. Two of the puzzles, however, received strong support in the open-ended feedback, suggesting that they hit a sweet spot between too difficult and too easy.

In Intervention 6, results for reviewing (3.78) and learning new (2.94*) content still lagged behind results for critical (4.33) and creative (4.28) thinking. There may have been less cognitive overload (2.83*) than in Intervention 5.

Results pertaining to Research Question 2 also formed interesting patterns. Students in five of six interventions reported that the activity was better for reviewing content (3.73 overall) than for learning new content (3.36). This was supported by coding analysis of student comments. Six students lauded the interventions as a method of review, but none specifically recommended escape games as methods of learning new material. Additionally, escape games were found to be better at encouraging ways of thinking than at covering content. Students reported overall positive results in terms of critical thinking (4.35) and in terms of new ways of thinking (4.33). The coded student comments also support this claim, as nine students commented positively on critical thinking, and five commented positively on creative thinking, while no students

commented negatively for either of these items. This suggests that escape games could effectively be used in tandem with other classroom strategies that are effective at introducing or reviewing content.

For the most part, students reported less positive data for measures of cognitive development after their second escape game, which mirrors these findings in the affective realm. And though measured cognitive overload was never statistically significant, a suggestive pattern emerged. Each class reported more during its second intervention (2.09* to 2.71*, 2.9* to 3.6*, and 1.82* to 2.83*). This, like the data on distraction, indicates that my own poor game design contributed to worsening cognitive results during the second round of intervention.

Research Question 3

How do students respond to educational escape games in terms of their interpersonal development, including collaboration and communication skills?

In Intervention 1, students reported that the game strongly encouraged collaboration (4.55) and communication (4.55). In Intervention 2, feedback on collaboration (4.63) and communication (4.6) was high, and this was also reflected in open-ended responses like "the teamwork was fun." In Intervention 3, feedback on collaboration (4.82) and communication (4.82) both remained extremely positive. I think the choice of a very collaborative puzzle as the first puzzle contributed to setting a tone of cooperation for the entire game.

In Intervention 4, feedback on collaboration (4.64) and communication (4.57) remained quite high. This suggests that the overall structure of the escape game provides strong interpersonal benefits even when, due to poor puzzle design or pre-existing student

learning preferences, the puzzles themselves are less engaging or motivating. This theory was supported by data from Intervention 5. Feedback for collaboration (4.3) and communication (4.32) still rated positively, though less so than in most previous interventions. Also in keeping with the pattern, students in Intervention 6 rated opportunities for communication (4.44) and collaboration (4.61) quite highly.

The results for interpersonal development were consistently the most positive throughout the intervention process. Collaboration (4.57 overall) and communication (4.53) remained high for all groups, even when other measures of success in the affective and cognitive realms dropped, and even when there is doubt as to the quality of the game design. Twelve students commented positively on their experience collaborating, with none commenting negatively. Several other positive comments referred to the benefits of competition with other groups, which I may have been remiss in not including as a category on the questionnaire. This indicates that escape games can potentially be very useful in helping students develop interpersonal skills.

Summary

The findings from this set of interventions were not always consistent. Frequently, different students in the same intervention provided directly contradictory feedback on the effectiveness of game design or their experience as players. However, a number of overall patterns developed. Students showed fairly high levels of engagement and other affective virtues, though over time results suffered due to loss of novelty and poor game design. Cognitively, escape games show more promise at training students in ways to think, rather than at teaching them specific content, and escape games show great potential as drivers of interpersonal skill development. In Chapter Five, I will discuss and

interpret these results in greater detail, and with more consistent reference to existing literature on educational escape games, cognitive theory, and the teaching of high school social studies.

Chapter 5

Discussion, Conclusions, and Recommendations

Overview of Study

As a high school social studies teacher, I am always looking for teaching strategies that might help me improve educational outcomes for my students. My personal experience with escape games pointed me toward their potential as a tool for learning. But this approach is relatively novel. Thus, my problem of practice is the fact that there is not enough data on escape games to know whether or how to use them in the classroom. I developed three research questions to guide my exploration of escape games:

1. How do students respond to playing and designing educational escape games in terms of their affective development, including engagement, resilience, and intrinsic motivation?
2. How do students respond to educational escape games in terms of their cognitive development, including content mastery and critical thinking skills?
3. How do students respond to educational escape games in terms of their interpersonal development, including collaboration and communication skills?

By exploring these questions, I hoped to contribute to the literature in a way that could significantly develop my own pedagogical practice and that of my colleagues. If I produced and analyzed data from the use of escape games in my own classes, I could

help teachers move away from a recall-based approach to teaching in favor of a more constructivist approach. This constructivist approach is the theoretical framework of my study. A student-centered, constructivist understanding of educational purposes and practices is important for the benefit of my students as flourishing individuals and as members of a diverse, democratic society. Even if my research had found that escape games were not especially useful for education, at least this study could have kept me or others from spending time and resources on a path to nowhere.

I conducted my research at the urban public high school in the Southeast where I have taught for the last eight years. Three class groups, including one Honors Economics class of 12th graders and two AP Government classes of 11th graders, took part in the study. Each class had about 20 students of various racial backgrounds and genders. I engaged these classes with two educational escape games each, with a gap of several weeks between the first and second interventions for each class. In the weeks after the second round of interventions, the AP Government classes also designed their own educational escape games.

From each intervention I collected an assortment of data. While students were engaged with the escape room, I wrote down my observations of their behavior, and I reflected on them afterward. Students provided quantitative feedback about their experiences by responding to 11 different statements on a Likert-scale questionnaire. They also responded in writing to a series of open-ended questions about their experience and various aspects of the game design. After that, I conducted a group interview with the class to follow up or expand on any feedback they had. I analyzed the quantitative data by calculating averages and statistical significance of responses for each intervention

singly and for all the interventions together. I analyzed the qualitative data in a more inductive fashion, coding it and searching for patterns, connections, contradictions, and ideas. I tried to bring the various types of data into conversation with each other to better triangulate my findings. As I produced data and analysis, I applied it to my practice, so that the study evolved as it went on. I planned to analyze and discuss the student-designed escape games with reference to Bloom's Taxonomy. However, my main finding consisted of the fact that student-created escape rooms showed evidence of knowledge creation. I thought this result was uninteresting and tautological, so I have omitted this Intervention 7 from my findings and discussion.

I generally found support for the idea that escape games represent a useful classroom strategy. I directly observed a great deal of student engagement, resilience, collaboration, and communication. The quantitative data corroborated mostly positive results for Research Question 1, concerning students' affective development. Engagement (4.37), resilience (3.8), and intrinsic motivation (3.85) all showed significant benefits. Feedback on distraction (2.88*) was neither encouraging nor statistically significant. Feedback on Research Question 2, concerning student cognitive gains, was also generally positive. Escape games were seen as an effective method to spur critical thinking (4.35) and new ways of thinking (4.33). Reviewing content (3.73) and learning new content (3.36) were somewhat supported by escape games. Cognitive overload (2.79*) was not measured as significantly different from the mean response on the Likert scale. Feedback on Research Question 3, concerning interpersonal benefits for students, was most positive. Students reported strong perceived benefits for both collaboration (4.57) and communication (4.53).

In this chapter I will first discuss the relationship between my findings and relevant existing literature, with a dual focus on constructivist learning theory and the more recent research on educational escape games. After that I will make recommendations, based on my findings, for other educators who want to employ escape games in their own classroom contexts. I will explain my own plans to implement the findings of my research in my classroom and elsewhere. Next I offer some reflections about my experience with action research, including the aspects of my study that I found surprising. I will explore some limitations of my work, as well as recommendations for future research. This chapter concludes with a brief summary.

Results Related to Existing Literature

Many of my findings build on or relate to insights from my theoretical framework, constructivism. There are many sides to constructivism, however, so it will be useful to clarify what this means. First, the escape games seemed to support the constructivist view of human nature. My students enjoyed the escape games, and a constructivist-minded theorist would argue that the pleasurable nature of these experiences contributed to the educational benefits shown in the data (Matthews, 2003). Early thinkers who contributed to constructivist theory, such as John Dewey, explained that students find innate joy in learning, and thus engaging activities will take advantage of their intrinsic motivation to learn (Schiro, 2013). Indeed, some of my students were so engaged with the escape games that they came back in during lunch to supervise their friends (who were not in my class or sample population) as they attempted the escape games.

The interventions gave some credence to constructivist learning theory, which posits that the responsibility and the agency that escape games required of students would have contributed to my positive results (Oliva, 2009). Students gave feedback asking for a more convincing back story to the escape games, which reflects the constructivist claim that learning is improved when it occurs in real-life, context-rich situations (Jonassen, Mayes, & McAleese, 1992). However, my results may have implied but did not clearly demonstrate a causal link between learning and agency or context. This may be an area for future researchers to explore more closely.

My students reported the most success with cooperation and communication, and I observed them constructing their own approaches to working together. Moreover, these interpersonal skills are seen by social constructivists as the wellspring of further knowledge creation (Wiersma, 2008). These findings may also deserve closer research.

The constructivist framework of my research created some dilemmas in terms of my cognitive goals for students. I wanted to develop a useful pre- and post-intervention knowledge assessment as Eukel et al. (2017) did, because knowledge recall and understanding are important outcomes, even if they do not involve the construction of knowledge. However, I was unable to devise a fair test of this type of knowledge. As Mergel (1998) points out, constructivist teaching strategies make it difficult to create and assess a common set of learning outcomes. Monaghan and Nicholson (2017) point to one solution, as their structured written reflection that focused on the academic content of escape game seemed to contribute to their success in conveying content and assessing students' understanding of that content.

My results do show more success in relation to students actively constructing knowledge using the methods of historians. My students who became absorbed in the first puzzle from Interventions 2 and 3 clearly constructed knowledge about documents through Wineburg's (1998) processes of sourcing, corroboration, and contextualization. Quantitative and qualitative feedback from these interventions support the idea that this puzzle helped students construct understanding. Such open-ended puzzles may provide "a more structured framework to implement constructivist methodologies" (Giang et al., 2018, p. 10). This might be another way to avoid the difficulties in assessing cognitive gains that Mergel (1998) mentions.

Many of my findings related directly to existing conversations in the literature on educational games and escape rooms. Lameras et al. (2017) stressed the importance of connecting the game mechanics to specific learning goals. However, I sometimes designed puzzles without a direct connection to class content, or without using Bloom's Taxonomy to consider the type of knowledge I wanted to convey or elicit (Armstrong, 2017). I believe this oversight in the planning stage contributed to weak or inconclusive data with respect to content delivery. I believe I could also have improved the rigor of my escape games by more consistently following escapED, a theoretical framework developed by Clarke et al. (2016). That framework emphasizes aspects of escape game design that I should have more thoughtfully considered, such as linking learning objectives with puzzle design, pre-testing the game, and evaluating learning objectives. Based on the coding of students' comments, approximately half of all feedback had to do with problems of my puzzle design.

My experience also supported the claims of Lameras et al. (2017) on the role of the instructor. They argued that teachers in a game situation should try for a flexible and mostly hands-off approach that supports students while encouraging their agency. I observed that placing restrictions on timing for students to get hints kept them more focused on solving puzzles and less interested in pumping me for information. Likewise, allowing students to struggle on their own and even to fail seemed generally to increase engagement and the students' satisfaction at the end of the experience. My findings also supported Csikszentmihalyi's theory of flow, as students seemed to benefit from facing increasingly difficult puzzles after they gained practice on easier ones (Monaghan & Nicholson, 2017). Lameras et al. (2017) argued that student achievement in educational games should be assessed through a mixture of quantitative and qualitative methods, and I found this to be the case. The quantitative data and the qualitative data provided insight into different aspects of the escape game, though they were consistent with one another and generally also with the existing literature on escape games.

My quantitative data connects most directly with Eukel, Frenzel, and Cernusca (2017), as I tried to use their measures and methods where possible. My study and theirs both found statistically significant impacts on students' perceptions across a range of dimensions. For the following discussion, their data will precede mine within each set of parentheses. We both found that the escape game activated of new ways of thinking (4.3 and 4.33). We also both found that students rated escape games better for reviewing old content (4.3 and 3.73) than for learning new content (4.2 and 3.36). The previous study, however, showed greater success at both types of content delivery than mine did. The success of Eukel, Frenzel, and Cernusca in these cognitive measures could be due to the

natural ease with which pharmacy lessons translate into laboratory puzzles, or simply to that research team's greater success at game design.

My data mirrored Eukel, Frenzel, and Cernusca's (2017) finding that escape games effectively promote collaboration between students (4.4 and 4.57), though their phrasing of the prompt in the Likert scale also differed from mine. My study showed lower levels of distraction (3.4 and 2.88*) and cognitive overload (3.7 and 2.79*) than did Eukel, Frenzel, and Cernusca's, though my feedback on these measures was not statistically significant; and the previous study's higher levels of distraction and cognitive overload were still lower than their data pertaining to other measures. It is possible that the immersive narrative of their pharmacy-based game increased the perceived stress levels of their students in a way that made distraction and overload more of a problem. However, this explanation is less plausible if we consider Csikszentmihalyi's theory of flow, which holds that immersive narratives positively affect student performance by increasing their engagement (Monaghan & Nicholson, 2017).

Giang et al. (2018) also used a mix of qualitative analysis and quantitative measures, including a 4-point Likert scale, to measure outcomes and perceptions. Their quantitative data showed very little difference between male and female respondents in terms of the perceived usefulness of an escape game. This matches my own observations in my AP Government classes, where I discerned no significant patterns along gender lines. However, in my Honors Economics class, I observed more engagement among males than females. I did not track gender along with the Likert scale data I collected, so these patterns could be due to my weaknesses as a subjective observer of my interventions. The differences could also be due to the smaller populations of my

individual classes, which would produce data not as robust as the 61-student population that Giang et al. used (2018). Much of the other quantitative data produced by Giang et al. is not directly comparable to my own. However, like my study, theirs also found that students perceived the escape game as very entertaining and benefited from the collaborative nature of the experience.

My findings strongly supported the conclusions and prescriptions of Rouse's (2017) research, which involves her dual experiences as a player and as a game designer. Like Rouse, I found good communication and collaboration to be essential elements of escape games. Her advice to limit the time available to students helped make the games in my classroom more intense and engaging based on my observations and on student feedback. Many of my logistical problems arose because I failed to follow her advice by satisfactorily play-testing games before giving them to the entire class. Rouse writes that it is better to let students find their own ways of collaborating, even if it involves struggle, than to give them too much guidance, and this also is supported by my observations (2017). My experience also supported Rouse's advice that games should start with easier puzzles and build to harder ones. This allowed students to learn the rules of the game and develop some confidence before they confronted the most difficult puzzles.

Monaghan and Nicholson's (2017) claims that escape games promote motivation and engagement are well supported by my data. As they predicted, my students especially engaged with the puzzle that allowed them to visit another classroom. My findings also supported their statement that overly vague instructions can spoil the game by leaving students frustrated, as I especially learned from Intervention 5. Coding of student

responses revealed that the second-most common sentiment was negative reaction to such logistical shortcomings. Elsewhere Nicholson (2016) writes that good game designers will craft puzzles in a sweet spot between demanding too much diligent effort (which players experience as busywork) and demanding too much guessing (which players experience as random). My experience supported this claim. He also writes that the use of red herrings, or misleading clues, are controversial among game designers. Some designers argue that they merely frustrate the players because they can make effort meaningless. Other designers find red herrings to be useful, as they can force players to think critically about what is important and what is not. Feedback from my students strongly supported the first understanding of red herrings; when I thought I was designing a puzzle with clever misdirection, it usually simply decreased my students' appreciation of and engagement with the escape game.

Humphrey (2017) argued that educational escape games were good for pushing students to "think outside the box" and to deal with real-world issues like time deadlines and collaboration. My student feedback supported these claims through both quantitative data and qualitative feedback. Borrego et al. (2017) wrote that when student groups can work on multiple puzzles at the same time, it adds to smoothness of the experience. My interventions also supported this. Having multiple puzzles going simultaneously allowed my students to flexibly shift their attention and resources in response to challenges. Borrego et al. also advised that confronting students with puzzles of various difficulty levels is important, and my research supported this. When students could see progress on easier puzzles, it helped them build the confidence necessary to handle more difficult challenges.

One surprising aspect of my findings was the extent to which they almost uniformly supported other research into escape games. My data and analysis do not uncover or develop any new controversies or battle lines in the literature. I have found several areas I would like to explore in the future, but perhaps my main contribution to the literature is simply the thickening of the existing data.

Practice Recommendations

Based on my findings and the existing literature, I would make several recommendations for teachers who use educational escape games. To begin with, teachers should work to make escape games more useful for conveying and reviewing content. I designed some puzzles without enough connection to class content, and quantitative data reflected this. Teachers should follow the lead of Monaghan and Nicholson (2017) by engaging the students with a post-game debriefing on matters of content as well as game design and playability. Monaghan and Nicholson also encourage teachers to develop escape games that are less linear, as this gives students more agency and engagement. As a beginning game designer, I did not follow this advice adequately. They also advise teachers to flesh out the narrative of the escape game with an immersive atmosphere, including setting and props. This was somewhat beyond my resources, but I would recommend it to educators who have the ability to do this. Nicholson (2018) warns teachers off designing puzzles that are essentially worksheets that produce a lock combination, again because the artificial nature of the task makes it difficult for students to fully engage. I second this recommendation for other educators.

With the above recommendations in mind, I believe the use of educational escape games is very transferrable to other contexts. I observed that the success of my

interventions depended much more on the proper design of the escape game than on the makeup or purpose of the class. However, as my classes are all relatively small groups of Honors and AP-level upperclassmen, I cannot make convincing claims about the success of escape games in larger classes or among younger or less academically advanced students. Merriam and Tisdell (2016) state that flexibility and responsiveness in the face of emerging data are very important for the success of action research projects. I did not follow Mertler's research framework strictly, but I would strongly recommend that other educators follow his advice to adapt their use of escape games after generating initial data from their own classrooms (2012). This responsiveness could increase the transferability of my findings to other contexts.

Implementation Plan

Action research is often primarily focused on improving the teaching practice of the researchers themselves. This is the case in my study, so the most important aspect of my implementation plan involves my own classroom. I plan to improve the escape games I have already tested and use them in my classes in the future. I will put into practice my key findings, such as the importance of content debriefing and building immersive narratives. I will continue to visit recreational escape rooms in my city to gather ideas about puzzles and narratives.

I also want to share my findings with my teaching colleagues. Together with two other teachers at my school, I received a grant to buy escape game puzzle components. I plan to help these co-workers and any others who are interested to use the hardware we bought in their own classes. Beyond my school, I am a member of several internet groups of teachers who share resources. I plan to share my experiences and puzzles with these

teachers, so they can transfer what I have learned to their own contexts. The deep description of my own context that I have included in these chapters should help other teachers determine whether my findings apply to them. I have communicated online with several other teachers who have researched or developed escape games, and they are interested in applying what I have learned.

Reflection on Action Research

Action research is commonly and effectively used by educators in their own classrooms in order to improve their practice (Herr & Anderson, 2015). I found the action research approach to be intuitive and helpful. It allows for a great deal of methodological flexibility, so teachers can adapt the approach to fit their context. I had expected escape games to be engaging and effective, and to a large extent my findings showed this. However, I was surprised at how difficult it was to measure progress on the particularly important measures of reviewing old content and conveying new content. I now see that I did not really think through the difficulties that constructivist educators often encounter when trying to ensure that students learn particular content (Kaiser, 2010). If I were to go back in time and re-do my study, these difficulties might be a more important focus of my research. Likewise, I was surprised at the uninteresting and uninformative nature of my analysis of Intervention 7, when students created their own educational escape games. This is why I barely mentioned the data from this intervention in this analysis. It is possible that a different framework than Bloom's Taxonomy might have pointed me toward more productive analysis.

I was also surprised to find how useful quantitative data was for my investigation. I had planned to focus predominantly on verbal student feedback and my own

observations as sources of data. I had thought that the quantitative data I gathered from the Likert-style questionnaire would not interact productively with the qualitative data, but I think the interplay between these data helped me uncover useful patterns and connections. My quantitative data was more internally consistent than I had expected, and matched up more closely to similar data produced by other researchers like Eukel et al. (2017). This gives me confidence to develop a more quantitative focus in my future action research.

Limitations or Suggestions

My research is certainly limited by the fact that my classes represented a very favorable academic environment, which does not necessarily correspond to conditions in many cases. It is unclear how well educational escape games can succeed in for students who are academically below grade level or less mature. I also chose not to include demographic data in my questionnaire, so my reflections on the helpfulness of escape games for various groups is based on my subjective observations. Further, there was no control group in my study. It is difficult to draw rigorous conclusions about my data if I have no quantitative baseline for comparison. Informally, of course, both student-reported data and my own observations were often couched as contrasts with my typical, non-escape game classroom strategies.

Another limitation of my study is that the quantitative data were self-reported by students. Students may have felt the experience of exploring new ways of thinking or collaborating with their classmates, but there might be more objective ways to measure these dimensions of learning. Still, my reliance on student perception of the quantitative dimensions did allow me to compare my findings more directly with other researchers

who have evaluated the use of escape games. One measure used by previous researchers that I failed to replicate is the pre- and post-intervention content test. While Eukel et al. (2017) found strong support in the test data for escape games' ability to convey content, I relied on subjective feedback from the students, and my results on these cognitive measures were less positive than on most other dimensions.

A final set of limitations of escape games is that they are simply difficult to employ as classroom strategies. Even though BreakoutEDU and some other amateur websites are making more of them available, it can be hard to find a well-designed game for many subjects and grade levels. Teachers who want to design their own games face a number of difficulties, including many that I encountered in my attempts at creating puzzles. Further, the hardware many people use to play escape games can run into the hundreds of dollars.

Recommendations for Future Research

Many of the limitations of my study could be corrected in future research. I would recommend that others make a stronger attempt to adopt the pre- and post-intervention knowledge test method employed Eukel et al. (2017). Exploring the nuances of group dynamics and interpersonal development goals could also be fruitful. The use of a control group could also improve the usefulness of quantitative data. I recommend that future researchers develop a way to more usefully analyze the student-created escape games that mine developed during Intervention 7. I was hampered by a lack of grounding in project-based learning and a poor fit between the theory and data of Intervention 7 and the previous interventions. A proper exploration of student-created escape games could be a full action research dissertation of its own.

I also recommend that educators quantitatively analyze the effects of escape games on various populations. Among my students, my subjective observations pointed to gender as an important area of research, and to students with personalized education plans as another area. If I were to formulate two more research questions I most want to see explored, they would be:

1. To what extent does a student's gender affect their experience playing and designing educational escape games?
2. To what extent can students identified as being along the autism spectrum benefit from playing and designing educational escape games?

Summary

In this action research study I have attempted to determine whether educational escape games can be successfully utilized in high school social studies courses. I engaged three of my classes in a series of escape games to determine how well this teaching strategy met my goals for them in the affective, cognitive, and interpersonal realms. During and after each intervention, I gathered and analyzed a mix of quantitative and qualitative data. My interventions showed many of the characteristics predicted by constructivist theorists, such as the inclination of students to engage with meaningful, interactive learning opportunities, and the difficulty of assessing content learned in constructivist classrooms. My study also supported many of the claims of the existing literature on educational escape games, such as the beneficial effects of escape games on collaboration and communication. I made a series of recommendations for other educators using escape games, such as play-testing puzzles and making sure the games' logistics are well explained. All in all, I think my research has successfully engaged with

my problem of practice by helping to address the thinness of the literature. There is still much to be learned about educational escape games in the classroom. However, I found them to be an interesting addition to my teaching repertoire, and I would strongly recommend them to other educators.

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Appendix A

Full Blank Questionnaire

Please rate your experience with the escape game today. Do not select more than one answer per row.					
Statement	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
The escape game was interesting and engaging.					
The puzzle aspects of the escape game were a distraction from learning about content.					
The escape game motivated me to keep trying when I faced temporary setbacks.					
I wanted to complete the escape game even without rewards, like grades.					
The escape game was an effective method for me to review course content.					
It was difficult for me to focus on learning because I was feeling stressed or overwhelmed.					
The escape game was an effective method for me to learn new content.					
The escape game encouraged me to think critically or analytically.					
The escape game encouraged me to think about content in new or creative ways.					
The escape game encouraged me to work together to solve problems with my peers.					
The escape game encouraged me to communicate effectively with my peers.					
About the escape game, I liked…					
About the escape game, I disliked…					
My suggestions for improving the escape game are…					

Appendix B

Observations and Reflections, Blank

Observations	Reflections

Appendix C

Introduction to Business Economics Breakout, Intervention 1

Goal 1: Open large box secured by 5-arrow lock	Puzzle 1: 5-arrow lock	Set up: Students get the prompt below in an envelope. *Let's say movie tickets are a perfectly elastic good. What happens to the equilibrium price of movie tickets in Columbia when:* 1. *The government puts a special tax on Netflix.* 2. *A movie comes out that everyone wants to see.* 3. *The government gives a subsidy of $5000 to each movie theater.* 4. *Half of all teenagers go blind.* 5. *The government says all existing theaters have to stay open, but can only sell 20 tickets to each movie screening.*
		Solution: up-up-down-down-up
Goal 2: Remove 3 locks from hasp that secures small box	Puzzle 2: 5-letter lock	Set up: Inside the big box is a black light flashlight and paper that asks: *Who's your daddy?* Written on back of paper in invisible ink is the word *HINT* and a drawing of a hand
		Solution: SMITH. Adam Smith is the father of economics, and the coiner of the term "invisible hand."
	Puzzle 3: 3-number lock	Set up: Inside the big box is also a piece of paper that asks: *Where's supply?* Textbooks are placed various places throughout the classroom.
		Solution: 125 That is the page in the textbook on which the Supply Unit begins.
	Puzzle 4: 4-number lock	Set up: Inside the big box is also a piece of paper that says: *First, you just do what your parents did. Then, there's lots of individual freedom from governmental interference.* Textbooks are placed various places throughout the classroom.
		Solution: 3945 39 is the page in the textbook that describes a traditional economy. 45 is the page that describes a market economy.
Inside the small box is a letter of congratulations at solving the puzzles and some candy as a reward.		

Appendix D

Observations and Reflections, Intervention 1

Observations	Reflections
Groups looked at each other but didn't seem to get answers to clues from each other.	I think the competitive aspect of students being in the same room with other teams was a net positive. I noticed that groups who were behind kept looking at the group that had finished more of the puzzles, and it seemed to keep them motivated. I also had droning music playing in the room, so teams wouldn't overhear each other say the answers, and this appears to have worked.
There seems to be no difference in engagement in terms of race/ethnicity, though perhaps the girls are less into this than the boys	I'm not sure why the gender imbalance was there. Perhaps the boys are more experienced in games. In any case, I should keep an eye on the gender difference in future data collection.
Some groups are dividing up what tasks they're doing longer term, while others have people trading roles frequently	It's not clear that either approach is necessarily better for solving the game. I could speak more in the future about how students can divvy up roles, but I think it's also important for them to figure it out as they go along.
Some checking of cell phones, but much less than in a normal class	This seemed like a strong signal of engagement (maybe even more persuasive than Likert responses about engagement that the students gave).
One group almost got a puzzle right that depended on finding a particular page number, but they're on a similar page right next to the one they need	This definitely makes me want to do a better job of making my puzzles have an unambiguous answer. I didn't have time to have a colleague test-run this escape game before I gave it to my students, so I should do this in the future.
One group had the right answer for fifteen minutes, but didn't know how to open locks	I might need to do a better job explaining how to deal with locks. I guess I had assumed that everyone would know how to deal with a letter combination lock. I didn't realize the group was stuck on that problem. I don't want to observe groups overly closely, because I think the freedom to fail

	and the idea that students have agency is an important aspect of the escape game.
Kids who grind out bookwork are doing fine at the escape game, but the students who slack on their homework or reading are engaged way more than usual	This does seem like a statement in support of giving students alternate ways of showing or developing their mastery of content. Some students just don't respond to learning from books, and need more active engagement.
My student on the autism spectrum is really outperforming his usual.	Another piece of evidence in favor of developing alternate ways of showing learning.

Appendix E

Honors Government/Economics, Intervention 1

Dimension	Item	Statement	Mean	Median
Engagement	AFF1	The escape game was interesting and engaging.	4.6	5
Distraction	AFF2	The puzzle aspects of the escape game were a distraction from learning about content.	2.45	2
Resilience	AFF3	The escape game motivated me to keep trying when I faced temporary setbacks.	4.18	5
Intrinsic Motivation	AFF4	I wanted to complete the escape game even without rewards, like grades.	4	4
Review Content	COG1	The escape game was an effective method for me to review course content.	4.45	5
Cognitive Overload	COG2	It was difficult for me to focus on learning because I was feeling stressed or overwhelmed.	2.09	2
Learn New Content	COG3	The escape game was an effective method for me to learn new content.	4.09	4
Critical Thinking	COG4	The escape game encouraged me to think critically or analytically.	4.55	5
New Ways of Thinking	COG5	The escape game encouraged me to think about content in new or creative ways.	4.45	5
Collaboration	INT1	The escape game encouraged me to work together to solve problems with my peers.	4.55	5
Communication	INT2	The escape game encouraged me to communicate effectively with my peers.	4.55	5

About the escape game, I liked…	A4	The Rewards
	PD	The puzzles
	I	The competitive nature
	I1	The working in team
	C4	The critical thinking
	C5	Trying new ways of learning
	A3	The challenging nature of the game
	A1	Being engaged
About the escape game, I disliked…	PD	The puzzles were confusing (2)
	L	The locks were physically hard to open
	PD	The puzzles were vague

My suggestions for improving the escape game are…	PD L L PD	Improve the drawing that is a hint (4) Make more helpful hints (2) There should be more puzzles The puzzles should be better constructed
Important student feedback from verbal interview:	L L L L PD PD PD PD A PD PD	"You should double-check locks to make sure they're engaged before the game." "I didn't like how the locks opened." "You should tell us how to open the locks." "We need more hints." "You need to improve the artwork." "You should add more layers of puzzles, and later puzzles should depend on earlier puzzles." "You should do more with the black light." "The clue that used the page numbers in the textbook was a good idea." "I liked it a lot." "We couldn't tell that the invisible hand was that, we thought it was a thumbs up." (4) "It was confusing because we didn't know that we had to use the textbook."

Appendix F

Historical Mastermind Breakout, Interventions 2 and 3

Read the following background to the students:

Mr. Davis has been a well-respected teacher at this school for many years. However, students who have taken his history classes have noticed his maniacal obsession with time travel and world domination. While waiting to speak with him during office hours, your friends have just discovered that Mr. Davis is plotting to go back in time and change the course of history so that he will be the supreme ruler of the world. They found his evil plan sketched out on a series of notes laid haphazardly about his desk:

> My evil plan: 1. Brainstorm evil plan. 2. Build a time machine. 3. Travel back in time to 1992. 4. Change the course of history! Muhahahahahaha [evil laugh].

They also noticed that his computer is on and he has posted a new status that reads:

> "Feels like taking over the world today! :-)"

All of the evidence indicates that you do not have much time before Mr. Davis begins his journey back in time. You must locate the failsafe key in order to stop him from being able to use his time machine. A post-it note on his desk indicated that he has hidden the failsafe key in his classroom:

> "Failsafe Key - Classroom"

But locating the fail-safe key will not be easy since Mr. Davis has designed intricate puzzles to keep you from finding his secrets. Some facts about Mr. Davis may yield insight into his criminal mastermind. He loves history and is especially obsessed with historical thinking skills such as sourcing and contextualization. You will have to use your historical thinking skills to out mastermind Mr. Davis.

Now it is up to you! Only YOU can change the course of history.

Goal 1: Open large box secured by 5-letter lock	Puzzle 1: 5-letter lock	Set up: 1. Students get one sheet of paper reminding them of the "APPARTS" approach to contextualizing a document by considering its author, place/time, prior knowledge, audience, reason, the main idea, and significance. 2. Students also get five torn sheets of paper that show partial copies of documents relating to the Great Depression, the March on Washington, the Gettysburg Address, the 19th Amendment, and the Declaration of Independence. On each document, one letter of "APPARTS" is circled, to indicate which aspect of context is relevant; and students are prompted to come up with the correct contextual element by blank lines showing the number of letters in the word or phrase. One blank line on each document is also circled, indicating that the students should use that letter to open the lock.
		Solution: POWER The five letters are take from the correct contextual elements, which are: Great Depression, WashingtonDC, Lincoln, Suffrage, and Independence.
		Hint: Where did you have a dream? 1. What did Jefferson want? 2. Back when nobody could afford a Shirley Temple doll. 3. The guy could sure give an address. 4. This one goes out to all the ladies.
Goal 2: Remove 3 locks from hasp that secures small box	Puzzle 2: 5-color lock	Set up: Inside the big box is: a black light flashlight; a paper that advises the students in methods of map reading, reading like a historian, and chronological thinking; also, there is a piece of paper titled "Travel Itinerary for the Collection of Destructive Beasts." The paper has pictures of the Green Bay Packers, the White House, Red Square, Yellowstone Park, and Greenland. When students shine the black light on the paper, the order of the pictures is revealed in invisible ink.
		Solution: green, white, red, yellow, green
		Hint: A park, a home, a quadrilateral, an island, a town.
	Puzzle 3: 3-number lock	Set up: Inside the big box is also a loose, unordered stack of pictures. Each picture has part of a mathematical equation on it. The pictures must be sorted into the three eras they come from: the Civil War Era, pre-World War I American foreign policy, and the Civil Rights Era. Then the pictures must be chronologically ordered. The correct order allows students to tally the three different equations, yielding three digits for the lock.
		Solution: 387
		Hint: 1. In no particular order – Nat Turner, reconstruction, bleeding Kansas, Fugitive Slave Act, Grant in uniform 2. In no particular order – League of nations, Taft, Spanish-American War, Wilson, Roosevelt 3. In no particular order – a march, little rock, freedom rides, black panthers, Rosa Parks

	Puzzle 4: 4-number lock	Set up: Inside the big box is also a piece of paper that divides various elements of "Reading Like a Historian" into four different skills: Sourcing, Contextualization, Corroboration, and Close Reading. Ten different questions that belong to the different classes of skills are also in the big box, cut into small slips. Some of the slips have a particular number of asterisks on them. Students need to sort the questions into the four classes of skills, and then the numbers of asterisks in each class of skill indicates the four digits that open the lock.
		Solution: 4694
		Hint: Count the asterisks
Goal 3: Find the failsafe key and open the box containing the time machine controls	Puzzle 5: key lock	Set up: Inside the small box is the second part of a letter that they have already received half of, and a group hall pass to their English teacher's room. The letter, when completed, reads: *If the walls could talk the past would point the way back to you. Point back and light the way.* Students must go to their English teacher's room, where a number of historical portraits (with people pointing) are taped to the walls. When they shine the black light on the portraits, the fingers point to one letter each.
		Solution: When unscrambled, the letters read "CARLETON." There is a banner from that college back in my classroom, and the failsafe key is taped to the back of it.
Inside that box is a letter of congratulations at saving the world and some candy as a reward.		

Appendix G

Observations and Reflections, Intervention 2

Observations	Reflections
I picked teams randomly, and one team was entirely made up of low-performing students. They self-sabotaged and gave up easily.	I need to choose more balanced teams.
The music kept stopping while students were talking, which meant other teams sometimes overheard them.	I need to find better sources of music, which can reflect the theme of the game while still keeping teams from overhearing each other.
Some puzzles were too hard.	There is a balance between too hard and too easy, and I have not found it yet.
Some hints that I gave them verbally didn't work, so it turned into a verbal negotiation where they kept trying to wheedle more hints out of me without thinking about what I had just said.	I need to improve my method of dispensing hints. Perhaps having written hints in advance, that I can give out at certain times.
Some students had problems figuring out the locks, even though they had already solved the puzzles.	Even my more academically impressive students are having trouble with the locks, so I need to explain them even more in advance than I already did.
Students were very happy when they solved a lock they had been working on for a long time.	This speaks in favor of letting students struggle for a while without intervening.
They kept asking how much time they had.	I should probably buy a countdown clock.
There wasn't enough time for students to complete the game.	I don't think it's a good idea for the games to be too easy – there should be a legitimate risk of not winning. But if no team can complete the game in time, I might need to change something.

Appendix H

AP Government 3A, Intervention 2

Dimension	Item	Statement	Mean	Median
Engagement	AFF1	The escape game was interesting and engaging.	4.5	4.5
Distraction	AFF2	The puzzle aspects of the escape game were a distraction from learning about content.	2.7	3
Resilience	AFF3	The escape game motivated me to keep trying when I faced temporary setbacks.	4.05	4
Intrinsic Motivation	AFF4	I wanted to complete the escape game even without rewards, like grades.	3.89	4
Review Content	COG1	The escape game was an effective method for me to review course content.	3.7	4
Cognitive Overload	COG2	It was difficult for me to focus on learning because I was feeling stressed or overwhelmed.	2.9	2
Learn New Content	COG3	The escape game was an effective method for me to learn new content.	3.3	4
Critical Thinking	COG4	The escape game encouraged me to think critically or analytically.	4.45	4
New Ways of Thinking	COG5	The escape game encouraged me to think about content in new or creative ways.	4.45	4
Collaboration	INT1	The escape game encouraged me to work together to solve problems with my peers.	4.63	5
Communication	INT2	The escape game encouraged me to communicate effectively with my peers.	4.6	5
About the escape game, I liked…		PD The first puzzle C1 Fun way to review (3) I Competing with other groups C It was challenging and made you think (3) I1 The teamwork was fun (2) C5 Thinking creatively C4 Being analytical (2) A4 Satisfaction and fulfillment when my team completed a puzzle O The gamification of history C It's an effective test of content knowledge PD How the little details came together C4 Problem-solving (2) C1 Incorporation of stuff we learned in class C4 Made me think about chronology		

About the escape game, I disliked…	PD C1 PD C2 PD L O I PD PD C2	The math puzzle was too confusing (3) Probably couldn't learn new content, but it's good for review (2) Instructions were too vague (4) I felt rushed (3) The chronology puzzle My lock didn't work with the right code We got stuck The competition Required too much attention to detail The color-lock puzzle stress
My suggestions for improving the escape game are…	C PD L L PD PD PD PD A L L PD L	The pre-required content needed should be more general, with fewer specifics like dates Make it easier (3) Give more directions before the game (5) More hints Make the picture part clearer Make our goals clearer It would be more intuitive if some of the puzzles had fewer potential right answers Perhaps having a points system, where you gain points for solving puzzles and lose points for getting hints More hype and encouragement before the game to make us want to participate more Let us pick teams Try different group sizes Make hints more specific Add context
Important student feedback from verbal interview:	C3 PD PD PD	"We didn't know enough of the content before we started." "We needed a better hint for the color-lock puzzle." "The puzzle that required math was too confusing and had way too many pictures." (Much agreement.) "The first puzzle was the best because it was a mix of analysis and content knowledge." (Much agreement.)

Appendix I

Observations and Reflections, Intervention 3

Observations	Reflections
These groups really like the first puzzle.	It's important to have a good puzzle that's not too hard, and that gives everyone something to do, as the first puzzle. It gets the game started on the right foot.
It looks like groups aren't giving up, even if they haven't made progress in a while.	For a competitive classroom activity, balanced groupings are very important.
The groups who got there really enjoyed the plot twist of going to their English teacher's room to get the final puzzle.	Surprises and movement seem important aspects of student engagement. The trick will be to build these into future games without it getting predictable.

Appendix J

AP Government 3B, Intervention 3

Dimension	Item	Statement	Mean	Median
Engagement	AFF1	The escape game was interesting and engaging.	4.91	5
Distraction	AFF2	The puzzle aspects of the escape game were a distraction from learning about content.	2.73	2
Resilience	AFF3	The escape game motivated me to keep trying when I faced temporary setbacks.	4.45	5
Intrinsic Motivation	AFF4	I wanted to complete the escape game even without rewards, like grades.	4.36	5
Review Content	COG1	The escape game was an effective method for me to review course content.	4.18	4
Cognitive Overload	COG2	It was difficult for me to focus on learning because I was feeling stressed or overwhelmed.	1.82	2
Learn New Content	COG3	The escape game was an effective method for me to learn new content.	3.45	4
Critical Thinking	COG4	The escape game encouraged me to think critically or analytically.	4.55	5
New Ways of Thinking	COG5	The escape game encouraged me to think about content in new or creative ways.	4.45	5
Collaboration	INT1	The escape game encouraged me to work together to solve problems with my peers.	4.82	5
Communication	INT2	The escape game encouraged me to communicate effectively with my peers.	4.82	5

About the escape game, I liked…	A3	It was challenging
	I1	The interactive aspect helped me learn and kept it interesting (2)
	C5	The new ways of learning (2)
	C1	Fun way to review (2)
	I	Competing with other groups
	I1	The teamwork was fun
	A	It boosted my self-esteem
	C5	Thinking creatively
About the escape game, I disliked…	PD	Some puzzles weren't related to history
	PD	Some puzzles were too vague
	PD	The chronology puzzle (3)
	PD	We needed more directions for some of the puzzles
	PD	Rearranging words was challenging
	PD	The color lock had two possible options for polar bears (2)

	C2 PD	There wasn't enough time to complete it Solving puzzles that required outside knowledge we didn't know
My suggestions for improving the escape game are…	PD PD L PD L L PD	Make hints more clear Cover a broader set of historical topics Give more directions before the game(2) More hints on the first puzzle Let us pick teams Make the ending more clear Make it less about content knowledge and more about analytical/critical thinking
Important student feedback from verbal interview:	L L PD PD PD PD L L	"The theme and topic should be better explained beforehand." "The hints worked okay, but rather than giving us vague hints about all aspects of the puzzle, you should straight-up tell us part of the answer so we understand how to solve the other parts." "The math part was too confusing." "The first puzzle was the best because it was a mix of analysis and content knowledge." (Much agreement.) "I liked the color lock, but not the puzzles that required pre-existing knowledge." "We liked when we moved to Ms. Baggett's room, because it made it like a scavenger hunt." "It was good and suspenseful not to know how many boxes we were going to have to unlock." (Much agreement.) "We wanted more time, because we didn't manage it well since we didn't know how many puzzles there would be."

Appendix K

Lions, Tigers, Bulls, Bears, Oh My! Breakout, Intervention 4

<table>
<tr><td colspan="3">Read the following background to the students:

Lions, Tigers, Bulls and Bears, Oh My!
Lions, Tigers, Bulls and Bears, Oh My!
Bulls or Bears are taking over Wall Street. We need your help to save the market from losing all its value and sending the economy into a tornado tailspin. Can you help the Wizard stop the market from crashing, like a house on the wicked witch?</td></tr>
<tr><td rowspan="2">Goal 1: Open large box secured by 3-number lock</td><td>Puzzle 1: 3-number lock</td><td>Set up: Students get the prompt below in an envelope.

A: What year was the New York Stock exchange created?
B: What type of market is it called when stock prices are rising or are expected to rise?
C: What type of market is it called when stock prices are falling or are expected to fall?
D: What year did we enter the current Bull market?
E: Standard & Poor publishes a broad “index” (way of measuring ups and downs) of stocks that is a leading reflection of the performance of the stock market. How many companies make up the index?
F: According to Investopedia, how many Bear markets have we experienced since 1926?
G: A different average with fewer companies is the most common way regular people talk about the performance of the stock market. This average includes companies like Apple, Microsoft, Nike, and Wal-Mart. What is this average called?
H: How many companies are in that average?

D – A + E – H + F = ___</td></tr>
<tr><td></td><td>Solution: 667</td></tr>
<tr><td rowspan="3">Goal 2: Remove 3 locks from hasp that secures small box</td><td rowspan="2">Puzzle 2: 5-arrow lock</td><td>Set up: Inside the big box is a piece of paper that asks whether the share values of Facebook, Apple, Nike, Zynga, and Berkshire Hathaway went up or down over a particular time period.

Students should use their phones to research the changes in stock value.</td></tr>
<tr><td>Solution: down-down-up-down-up</td></tr>
<tr><td>Puzzle 3: 4-number lock</td><td>Set up: Inside the big box is also a black light flashlight and a photo of an impossibly long bull. The bull has a speech bubble that reads “Says FINRA.” The photo is cut into a number of puzzle pieces. On the back of</td></tr>
</table>

		the photo in invisible ink is the question, “How many days?” Students must assemble the puzzle, and then look at FINRA's website to determine how many days the longest bull market ever lasted.
		Solution: 4494
	Puzzle 4: 5-letter lock	Set up: Inside the big box is also a piece of paper with a QR code that leads to a video of a number of markets closing for the day. The only sound in the video is the closing bells chiming throughout.
		Solution: BELLS
Inside the small box is a letter of congratulations at solving the puzzles and some candy as a reward.		

Appendix L

Observations and Reflections, Intervention 4

Observations	Reflections
A number of students are really frustrated by this, and they are mostly girls who do really well in class but have shown less interest in the material and more ability to grind it out	In Intervention 1, I saw some of the same pattern. Escape games are not likely to be as engaging for students who are just trying to move through course content quickly and professionally.
Some of the students are just giving up, and others sped through and were very engaged.	There are some aspects of the puzzles that should clearly be improved.

Appendix M

Honors Government/Economics, Intervention 4

Dimension	Item	Statement	Mean	Median
Engagement	AFF1	The escape game was interesting and engaging.	4.29	5
Distraction	AFF2	The puzzle aspects of the escape game were a distraction from learning about content.	2.57	2
Resilience	AFF3	The escape game motivated me to keep trying when I faced temporary setbacks.	3.36	3
Intrinsic Motivation	AFF4	I wanted to complete the escape game even without rewards, like grades.	3.57	4
Review Content	COG1	The escape game was an effective method for me to review course content.	3.71	4
Cognitive Overload	COG2	It was difficult for me to focus on learning because I was feeling stressed or overwhelmed.	2.71	2.5
Learn New Content	COG3	The escape game was an effective method for me to learn new content.	3.86	4
Critical Thinking	COG4	The escape game encouraged me to think critically or analytically.	4.57	5
New Ways of Thinking	COG5	The escape game encouraged me to think about content in new or creative ways.	4.5	5
Collaboration	INT1	The escape game encouraged me to work together to solve problems with my peers.	4.64	5
Communication	INT2	The escape game encouraged me to communicate effectively with my peers.	4.57	5

About the escape game, I liked…	O	The candy
	I1	The working in teams
	C4	The critical thinking (3)
	O	The challenging nature of the game (2)
	C5	Thinking outside the box
	PD	The difficulty level was good and hard
	O	the idea of it
About the escape game, I disliked…	PD	The clues were confusing
	PD	The clues were vague
	A3	It made me mad when I couldn't get it (2)
	PD	The Bull puzzle (2)
	PD	The video clue
	PD	Too hard (2)

Specific feedback on the 4-number lock puzzle	Good pretty tricky (2) Hard to understand what we should do (3) easy too hard good and short very interesting too many possible answers	
Specific feedback on the 3-number lock puzzle	Very challenging not too hard (3) liked it good and short clever perfect	
Specific feedback on the arrow lock puzzle	Good extremely confusing (3) easy hard good learning technique	
Specific feedback on the word lock puzzle	Good because it was so obvious that it was hard to get not too hard (2) tricky hard to figure out because many words wouldn't work good good because it was different good and engaging perfect	
My suggestions for improving the escape game are:	PD PD A1 PD C1 A1 O PD	Make more helpful hints The clues should be clearer (2) I liked it Don't have the puzzle puzzle More related to class content Not to do it Pick candy other than chocolate Try google searching what we might search for so you can anticipate the sites we'll look at
Important student feedback from verbal interview:	A1 PD A1	“This was no fun at all.” “It wasn't clear what we were supposed to do.” “It was fun to use my phone.”

Appendix N

Constitution Breakout, Interventions 5 and 6

Read the following background to the students:

Oh No!

AP learned about some "testing irregularities" at our school during your Government Exam, and they've cancelled all your scores!

But you're not going to take this lying down. In fact, you've broken into AP central. Your plan: to erase all mention of irregularities from their database, and thus get your AP credits back. And while you're at it, you can change your score to a 5.

But there's one catch. They've protected their mainframe with a series of puzzles that they think only AP Government geniuses will be able to get through. So: can you solve the puzzles, make it to the database, and get your college credit back? You've got one hour until the guards come back from their lunch break, and if they find you, you'll go to prison for 5 to 10 years…

Goal 1: Open large box secured by 4-number lock	Puzzle 1: 4-number lock	Set up: In an envelope, students get the black light flashlight and one sheet of paper that features excerpts from each of the seven articles of the constitution. When they shine the flashlight on the paper, they find an unsolved math problem (that is missing numbers) running parallel to the excerpts, written in invisible ink. They need to identify the number of the article for each excerpt and solve the resulting math problem.
		Solution: 629
		Hint: Look at the paper sideways. You have a four-digit number, and you're subtracting a three-digit number from it to get your answer. Get your values from Let's Eat Jolly Ranchers and Smell Roses. Each Article is used only once.
Goal 2: Remove 3 locks from hasp that secures small box	Puzzle 2: 5-color lock	Set up: Inside the big box is a sheet of paper with the following prompts: 1. The end of Plessy 2. What kind of test keeps Ms. Tate from praying with you? 3. Florida, after Bush v. Gore 4. California and New York, these days 5. Ms. Childs can't stop you from wearing this, you peacenik

		Solution: brown, yellow, red, blue, black The references are to political events students have studied, including Brown v. Board of Education, the Lemon Test, and the black armbands of Tinker v. Des Moines.
		Hint: Four of these relate to important Supreme Court decisions, while one other one is more of a political culture thing.
	Puzzle 3: 3-number lock	Set up: Inside the big box is also a piece of paper with the question "How many of these are currently allowed by the Constitution?" There are also 12 small pieces of paper, each of which presents a political scenario. On the back of each piece of paper is a rune. There is also a sheet of paper that provides a translation of each rune into a letter. Students must sort the scenarios into constitutional and unconstitutional, then translate the constitutional runes into letters, then arrange the letters into the abbreviation "Sens"
		Solution: 100 There are currently 100 Senators allowed under the Constitution.
		Hint: Only 4 things are constitutional. Abbreviations are not to be overlooked.
	Puzzle 4: 5-letter lock	Set up: Inside the big box are also 4 pieces of paper that each have a QR code on them. They lead students to videos from the movie Animal House, the video game Legend of Zelda, the song Do Run Run, and a punk song called Federalist 10.
		Solution: PARTY All the videos hint at the idea of political parties. Animal House features a lot of parties, the hero of Zelda is named Link and parties are linkage institutions, parties run candidates in elections, and Federalist 10 concerns the role of factions, the most important of which might be political parties.
		Hint: *Where* do you destroy a guitar? *Who* has a sword? What do *they* do? *What* is mischievous?
Inside that box is a letter of congratulations at fixing their AP scores and some candy as a reward.		

Appendix O

Observations and Reflections, Intervention 5

Observations	Reflections
Cooperation doesn't always work – one group was reading numbers from opposite sides of the table and one person flipped them, making the puzzle impossible for a while	This might be the type of miscommunication that can't be foreseen and avoided through better game design.
Maybe make the 1st puzzle less misunderstandable – 2 groups got it fast, but one group took forever	I want some kind of outside-the-box thinking to be involved, so I don't want to remove the tricky parts entirely.
Many groups didn't know which puzzles belonged to which locks	I thought, during game design, that the puzzles were clever in their misdirection. But based on students' reactions, this vagueness is just bad.
Some groups divided jobs, but didn't look at the puzzles the others were working on – thus they lost the use of extra minds	I don't want to interfere with their collaboration strategy, but I hope they learned the lesson on their own from their failure to solve many puzzles.

Appendix P

AP Government 3A, Intervention 5

Dimension	Item	Statement	Mean	Median
Engagement	AFF1	The escape game was interesting and engaging.	**3.85**	**4**
Distraction	AFF2	The puzzle aspects of the escape game were a distraction from learning about content.	**3.25**	**3**
Resilience	AFF3	The escape game motivated me to keep trying when I faced temporary setbacks.	**3.25**	**4**
Intrinsic Motivation	AFF4	I wanted to complete the escape game even without rewards, like grades.	**3.45**	**4**
Review Content	COG1	The escape game was an effective method for me to review course content.	**3.1**	**3**
Cognitive Overload	COG2	It was difficult for me to focus on learning because I was feeling stressed or overwhelmed.	**3.6**	**4**
Learn New Content	COG3	The escape game was an effective method for me to learn new content.	**3**	**3**
Critical Thinking	COG4	The escape game encouraged me to think critically or analytically.	**3.9**	**4**
New Ways of Thinking	COG5	The escape game encouraged me to think about content in new or creative ways.	**4**	**4**
Collaboration	INT1	The escape game encouraged me to work together to solve problems with my peers.	**4.3**	**4**
Communication	INT2	The escape game encouraged me to communicate effectively with my peers.	**4.32**	**4**
About the escape game, I liked…		I1 The collaborative aspect (2) O It was less based on history PD Different types of puzzles like the QR codes C4 Critical thinking (2) O The general idea PD The alphabet code (2) PD The simpler puzzles PD Game aspect PD The clues were better PD The number hints O Winning (2) A1 Very fun puzzles		

About the escape game, I disliked…	PD PD PD PD PD PD PD PD	Inconsistency in puzzle format Correlations were a stretch (2) Seemed too "up in the air" Too complex in places Lack of clarity in places Too hard (3) QR code one (3) symbols
Specific feedback on the 4-number lock puzzle?	Rotating the paper should be more clear Challenged us to think Not clear what we were supposed to do It was medium difficulty It helped me understand the concept Fine Good (7) Make font easier to read	
Specific feedback on the 3-number lock puzzle?	Would have been better if I had understood it more (3) Too hard and confusing (5) The "sens" clue was too hard Very good	
Specific feedback on the color lock puzzle?	Good (10) Great Didn't know which clue went with it Too easy (4)	
Specific feedback on the word lock puzzle?	Too hard (3) Didn't know what to do (6) Liked it (2) Too random and difficult Made you think critically good QR code videos needed lots of data	
My suggestions for improving the escape game are…	PD L L PD PD PD C3 C L	Make instructions more clear (7) More guidance Make it more straightforward Make it clear which puzzles and locks are connected (4) Do things people actually know and not Zelda Maybe color code the puzzles and the locks Make it more like the first one, this was hard to learn with Puzzles should be more connected to content we're learning Don't play background music
Important student feedback from verbal interview:	(We ran out of time and did not conduct a verbal interview.)	

Appendix Q

Observations and Reflections, Intervention 6

Observations	Reflections
The timer seems to be helping them focus.	The small stress of having a clock facing them seems beneficial.
Students seem less frustrated by vagueness about which puzzle went with which lock.	It seems like there are good types of frustration and bad types, and not knowing which puzzle goes with which lock is the bad type.
I told them they could get clues at a certain time, but it would take them out of contention for the grand prize.	They seem less complain-y about getting hints now, as they know they have a choice to do so, but it will cost them.
Students are trying to game the locks by trying every possible combination.	This is another game design issue that I currently have no answer for.

Appendix R

AP Government 3B, Intervention 6

Dimension	Item	Statement	Mean	Median
Engagement	AFF1	The escape game was interesting and engaging.	**4.39**	**4.5**
Distraction	AFF2	The puzzle aspects of the escape game were a distraction from learning about content.	**3.29**	**4**
Resilience	AFF3	The escape game motivated me to keep trying when I faced temporary setbacks.	**3.83**	**4**
Intrinsic Motivation	AFF4	I wanted to complete the escape game even without rewards, like grades.	**4.06**	**4**
Review Content	COG1	The escape game was an effective method for me to review course content.	**3.78**	**4**
Cognitive Overload	COG2	It was difficult for me to focus on learning because I was feeling stressed or overwhelmed.	**2.83**	**3**
Learn New Content	COG3	The escape game was an effective method for me to learn new content.	**2.94**	**3**
Critical Thinking	COG4	The escape game encouraged me to think critically or analytically.	**4.33**	**4**
New Ways of Thinking	COG5	The escape game encouraged me to think about content in new or creative ways.	**4.28**	**4**
Collaboration	INT1	The escape game encouraged me to work together to solve problems with my peers.	**4.61**	**5**
Communication	INT2	The escape game encouraged me to communicate effectively with my peers.	**4.44**	**4**

About the escape game, I liked…	I1	The collaborative aspect (5)
	A1	Very fun puzzles (3)
	A4	it feels rewarding when you solve a puzzle
	PD	the letter clues
	A4	it was challenging
	C1	reviewing what we'd already learned (2)
About the escape game, I disliked…	PD	Some connections were a stretch
	PD	Too complex
	PD	Lack of clarity in places
	PD	Too hard
	L	It was hard to get started
	L	unorganized
	A3	I got stuck
	PD	Too confusing (3)

	PD PD	It was hard to connect things It felt arbitrary
Specific feedback on the 4-number lock puzzle?	Not clear what we were supposed to do (2) It was easy Too hard (2) Good (8)	
Specific feedback on the 3-number lock puzzle?	Would have been better if I had understood it more Too hard and confusing (4) The "sens" clue was too hard Very good (3) It was unclear (2)	
Specific feedback on the color lock puzzle?	Good (8) My favorite (2) easy (4) too easy (2)	
Specific feedback on the word lock puzzle?	Too hard (6) Didn't know what to do (2) Made you think critically It was challenging because the videos were too different Didn't like the videos (2) Didn't make sense We shouldn't need prior knowledge It was a huge stretch (2)	
My suggestions for improving the escape game are…	PD PD PD	Make instructions more clear Make it easier (2) make it more logical
Important student feedback from verbal interview:	L L L L C1	"Let us pick our own groups." "Don't put the timer on the board." "We needed more time." "Give each group some hints that they can use whenever." "Use more knowledge that we learned in the course so we can make more connections."