Spent: Changing Students’ Affective Learning Toward Homelessness Through Persuasive Video Game Play

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ABSTRACT
To investigate whether a persuasive game may serve as a way to increase affective learning about homelessness, this study examined the effects of procedural rhetoric and ethos in a video game designed to put the player in the shoes of an almost-homeless person. Data were collected from 5139 students across four states. Examination revealed that playing the game or doing the reading significantly increased the affective learning score after treatment with the game group scoring 1.57 points higher and the reading group scoring .66 points higher out of a score of 6. Findings indicate that students who played Spent sustained significantly higher scores after three weeks. Overall, findings suggest that when students play a video game that is designed using persuasive mechanics an affective change can be measured empirically.

Author Keywords
Affective learning; persuasive mechanics; video games.

ACM Classification Keywords
I.2.6. [Learning]: Concept learning and Knowledge acquisition

INTRODUCTION
Approximately 3.5 million people, 1.35 million of them children, are likely to experience homelessness in a given year in the United States [1]. On any given night 656,000 to 744,313 people experience homelessness [1]. Due to the recent foreclosure crisis, homelessness has been on the rise, and families living on the edge of homelessness face more and more tough choices every day. In 2003 children under the age of 18 accounted for 39% of the homeless population, and the number of homeless families with children has increased significantly over the past decade [1]. People who suffer from homelessness are citizens, immigrants, white, Asian, Hispanic, black, working full time, unemployed, veterans, addicts, and teenagers with all levels of education – these are similar demographics to people that play video games. There are over 183 million active gamers in the United States, over half of the population log onto virtual worlds to plan virtual battle, save virtual lives, and wage virtual war against inequalities like famine and poverty in make-believe lands. The immense immersive power of video games may be able to solve real world problems that affect millions of people on a daily basis, like homelessness, but to support that claim there is a need to examine the effect that playing a specific type of video game has on the affective learning of its players.

Research in learning video games has focused very much on content or procedural knowledge [2, 3]. However, new subsets of learning games, called persuasive games, have become more prevalent over the last ten years. Persuasive games are aimed at changing the attitude or behavior of the game players towards a particular topic (e.g., homelessness). The content in a persuasive game is what drives the persuasion necessitating a strong framework in the processes that drive affective change. This paper examines the change in affective learning experienced by students in grades 7-12 (ages 12 to 18) after playing the persuasive game Spent.

VIDEO GAMES AND AFFECTIVE LEARNING
Affective learning in games focuses on variables such as self-efficacy, feedback, social skill development, and transfer of learning. For the purposes of this study, a review of studies that relate to affective domain processes of motivation and engagement in learning follows. An early gaming study [4] by Paperny & Starn evaluated the effectiveness of action games dealing with health issues and learner characteristics (n=718) in a high school with students ages 13-18. The findings suggest that games produced significant knowledge gain and positive affective change towards the game as opposed to traditional instruction. The researchers found that students with low SES enjoyed and learned from games more than other students, demonstrating that games can be more motivating and engaging depending on student background. This early study led the way for more recent research into how games for learning contribute to affective change in different populations.
Another component of affective learning, and one that also relates to cognitive learning as well is the part that motivation plays in learning through games. Motivation as an affective process has been explored through game studies in various contexts. Okolo [5, 6] had confounding findings where drill and practice games were used with special education middle school students, to teach basic skills. The first study on keyboarding skills found that the process of game play had a detrimental affect on continuous motivation, while the second study on math skills found that game play had a facilitating affect on continuous motivation. These findings suggest that the subject area that the game falls under is a factor in whether or not motivation is facilitated. Conversely, Kashibuchi & Sakamoto [7] found that gaming with reversal role-playing using (n=279) 2nd and 3rd year high school students in Japan, facilitated conceptual knowledge most, and there were no effects of experimental situations on motivation.

Research on games designed around social issues is comparatively scarce in the field of learning sciences. Two key studies on affective learning focus on AIDS and homelessness respectively. Cahill [8] used descriptive quantitative methodology in a large-scale study (n=3829) with 5th-8th graders involving AIDS education. Using a simulation game the findings suggest that learning experience was enhanced and motivation toward subject were developed. Second, a dissertation by Lavender [9] explores how the perception of homelessness can be affected through game play. Lavender created a game called Homeless: It’s No Game and had adults play the game and then complete a survey to measure if perception of homelessness had changed. This quantitative study had three participant groups; playing the game, reading about homelessness, or control with a pre-post survey administered immediately and two weeks later; no significant effect was found.

PERSUASIVE GAMES

Persuasive games have been studied in various contexts with differing definitions over the past forty years. Predating the invention of the computer, humans have used play and games for teaching necessary skills and socialization for millennia [10, 11]. Games explicitly created to change attitudes and behavior date back to 1790, when British publishers of the New Game of Human Life advised parents to play the board game with their children and "request their attention to a few moral and judicious observations explanatory of each character as they proceed & contrast the happiness of a virtuous and well spent life with the fatal consequences arriving from vicious & immoral pursuits” [12].

In 1843 a board game released in the US called Mansion of Happiness gave instructions that instructed players to make good and moral decisions to gain the seat of happiness. Moreover, Milton Bradley created the Checkered Game of Life, in 1860 with the intention “to forcibly impress upon the minds of youth the great moral principles of virtue and vice.” While a commercial success that helped launch Bradley’s board game business, there is no evidence that it had any moral affect on the minds of children [12].

The 1960s and 1970s witnessed a surge of multiplayer simulations. Given credibility by the Rand Foundation, which developed a number of persuasive games for use in the Cold and Vietnam wars, most of these were intended for education, training, and exploring alternative courses of action [11] with some persuasive purposes. For example, sociologists at Johns Hopkins developed The Life Career Game, The Family Game, The Representative Democracy Game, The Community Response Game and The Consumer Game with game aims at the player learning the necessity to defer gratification through persuasion techniques [12].

Persuasive games today are an established part of video game landscapes. They have attracted the attention of the media [13, 14] academics [15, 16, 17], and funding agencies such as the MacArthur Foundation. How persuasive games persuade is a combination of several mechanisms grounded in game studies and communication theory.

HOW PERSUASIVE GAMES PERSUADE

How can video games “modify or change values, wants, and beliefs of others”? Attempts at analyzing persuasion date back to ancient Greece; according to Aristotle persuasion is achieved through rhetoric, and three parts that include ethos, pathos, and logos [18]. Ethos uses claims about the persuader’s moral character and his or her trustworthiness, an important aspect of the persuasion process if it is to be effective [19]. Pathos is an emotional appeal to secure the goodwill of the listener while logos is the reasoned argument that appeals to the listener’s rational mind. Aristotle’s categorization has been elaborated over time but is still useful for analysis of persuasion [15]. An important addition to the definition of persuasion is Burke, who in 1969 defined it as “the use of words by human agents to form attitudes or induce actions in other human agents”. While the term ‘words’ is limiting, Burke does also include non-verbal means of communication.

However, decades of research on advertising and marketing have confirmed that persuasion is a complex phenomenon dependent on many interrelated factors that make the cross-effects of these factors difficult to separate [20]. Factors such as the interest of receivers of the message, their level of education, their knowledge of the issue, their cultural background, their feelings about the originator of the message, the medium used for the persuasive message, and competing factors all influence the success or failure of an attempt at persuasion [20].
Persuasive games use several mechanisms of persuasion that have been posited by game researchers, including: immersion, flow, engagement, procedural rhetoric, and ethos.

**Immersion**

Immersion is the experience of being transported to an elaborately simulated place that takes over all attention and becomes enveloping [21]. Technology has increased the power of immersion through video games, “it seems that games as persuasive technology hold much promise for changing people’s attitudes: games are by nature interactive, and people tend to retain more impressions” [22]. Related to immersion is the concept of agency, which Murray [21] describes as the satisfying power to take meaningful action and see the results of our decisions and choices. Agency helps immersion build when our actions in the video game are appropriate to the game narrative, strengthening the belief in the consistency of the game world.

**Flow**

Flow has been a theory posited by some game theorists [23] that games are compelling because players are in a highly energized state of concentration and focus [24]. Flow is achieved when the level of the challenge and the level of the player’s skill is in dynamic tension, creating a highly focused state of mind. Amory [23] posits that the player can assimilate tacit knowledge through the process that is then assimilated and constructed after emerging from the state of flow.

**Engagement**

Engagement is closely related to flow where the player finds the game so engrossing that they assimilate facts and values without realizing they are doing so [25]. Research [26, 27, 3] supports the claims made above that games increase engagement through flow, immersion, and agency. Accordingly when players are more engaged with the game, they are more likely to see the situation from the perspective presented in the game. Yee and Bailenson [28] placed college age students in a virtual environment where they used avatars that resembled elderly people. The researchers tested the attitudes of the subjects towards the elderly and found that the computer simulation increased empathy toward people with similar traits to that of the avatar and decreased players’ stereotypes of the elderly. Another study on engagement by Goldsworthy, Barab, & Goldsworthy [29] found that adolescents with ADHD who played a simulation game performed significantly better than the control group on measures of engagement. Both of these studies demonstrate that games with a persuasive message can affect engagement through manipulation of the immersion elements within the game context. Engagement in *Spent*, the game chosen for this experiment is triangulated among three modalities. The player is the character and makes decisions as they would in real life, he or she has the ability to ask for help using social media, and every action is measured on a sliding monetary scale.

**Procedural Rhetoric and Ethos**

Both procedural rhetoric and ethos are Aristotelian theories of persuasion updated by Bogost [15] and Evans [19]. While Bogost defines procedural rhetoric as “the practice of using processes persuasively” [15], Evans argues that rhetoric is not enough and includes ethos or “persuasion by empathy, fact, and integrity” [19]. The *McDonald’s Videogame* and the *Resisting Game* are used to demonstrate where procedural rhetoric and ethos are exhibited through gameplay. The *McDonald’s Videogame* is an anti-advertising game, where games are a satire of specific companies and their business practices [30]

By demonstrating that every action in the game has consequences, which are built into the game structure by the designers, the rhetoric and ethos of these procedures not only allow the player to learn through game play but also are a more effective and longer-lasting way of assimilating information [15]. While Evans [19] argues that rhetoric alone is not enough, his use of the *Resisting Game* to demonstrate the power of procedural ethos is important to this study because it examines not only the message being sent but the messenger and the final outcome for integrity, empathy, and fact.

**MEASURING IMPACT OF PERSUASIVE GAMES**

Having established how games can persuade is there a way to determine how effective they are? How many students who play *Food Force*, a game that puts them in the shoes of a World Health Organization food worker and that has been downloaded 4 million times [31], retain an interest in the politics of food distribution after game play concludes? *America’s Army*, a game developed by the U.S. Army, has had players dedicate more than 160 million hours of game time [31] but how many of those players actually enlist in the Army? Games that are intended to lead to actions are easier to evaluate because you can measure the effect. For example, the effectiveness of a game that is aimed at persuading people to visit a website can be calculated by the number of players who clicked through from the game to the website.

When measuring a game without such concrete goals, such as the intention to influence the players’ change in affective learning by experiencing what it’s like to be almost homeless, this influence is more difficult to measure. In order to measure a change in affective learning by playing a persuasive game, this research propose to first establish whether or not there is a significant change when playing a game designed to be extremely persuasive through the use of both mechanics and topic. Thus, the following research question was proposed:

*RQ*: To what extent does affective learning differ immediately and three weeks after playing the persuasive game *Spent* for the game treatment group, controlling for gender and hours playing video games, as measured by the Affective Learning Inventory (ALI) compared to the control and comparison groups?
METHODS
This study used a quasi-experimental design with control and two treatment groups to compare the effects of playing a persuasive game on affective learning towards homelessness. The population of this study consisted of adolescents in grades 7 through 12 (ages 12 to 18) in formal education settings in the Midwestern U.S. The sample consisted of adolescents in grades 7 through 12 in public, private, and religious schools in four states of the Midwestern U.S. Using a purposive sampling [32] an email was sent to all principals of schools in Indiana, Michigan, Illinois, and Ohio asking them to forward a letter of introduction to their teachers. Given the nature of the study it was nearly impossible to get a probabilistic representational sample and a total of 346 classrooms agreed to participate. Ninety-four classrooms agreed to participate but did not start the project or completed only the demographic information; thirty-one classrooms did not complete the three-week posttest; twenty classrooms had fifty percent or more unlabeled student data; and one classroom had only three students. In total, 200 classrooms (n= 5139 students) completed the study. Twenty-four classrooms were from religious schools, eleven were from private schools, and 165 were from public schools. As this study does not introduce novel teaching methods it was approved through the Institutional Review Board (IRB) as exempt research and every teacher who agreed to participate had their entire class enrolled in the study.

Pretest-posttest control group design [33] occurred in two steps. The first step was where matching was employed on individual classrooms to ensure that there was equal representation in the pretest and no pretest groups. Second, randomization occurred for the experimental condition. For example, using a Solomon design, classes were assigned to game, reading, or control with a pretest and two posttests: one, immediately after treatment and a second at three weeks after the treatment. The pretest was used to ensure that the control and treatment groups were equivalent. Additionally classrooms were matched using the following variables: state, setting, and grade. This was done to minimize variance in the scores due to contextual effects and to create equal numbers for each of the treatment and control groups. This was done to ensure that across states, setting, and grade there were an equal number of classrooms participating in each of the groups. To do this a model was developed that looked at the total number of classes participating in each grade. After that the model split those classes in each grade by state and the type of school setting. Finally classes were randomly assigned to one of the three groups (control, reading, or game).

![Table 1. Solomon Design of Experimental Groups](image)

<table>
<thead>
<tr>
<th>Group</th>
<th>Pretest</th>
<th>Treatment</th>
<th>Post-Immediate</th>
<th>Post-3 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1 (Game)</td>
<td>01</td>
<td>X</td>
<td>02</td>
<td>03</td>
</tr>
<tr>
<td>T1 (Game)</td>
<td>06</td>
<td>X</td>
<td>04</td>
<td>05</td>
</tr>
<tr>
<td>Control</td>
<td>07</td>
<td>08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>09</td>
<td>010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T2 (Reading)</td>
<td>011</td>
<td>X</td>
<td>012</td>
<td>013</td>
</tr>
<tr>
<td>T2 (Reading)</td>
<td>014</td>
<td>X</td>
<td>014</td>
<td>015</td>
</tr>
</tbody>
</table>

Key: T= Treatment, O= Observation, C= Control

Affective Learning Scale (ALS)
The dependent variable was defined as the average score on the Affective Learning Scale (ALS) [34]. ALS has participants indicate their level of agreement with statements pertaining to the experience of that particular day in class.

Reliability and validity
Scott and Wheelless reported a .96 Cronbach’s alpha reliability for ALS, demonstrating a very high internal consistency that is explained by the semantic structure of the survey questions. Preliminary analysis of the ALS scores for this study found a similar high Cronbach’s alpha reliability (.944). Statements in this scale are highly circular asking similar questions with slight differences (the beginning of every sentence is the same and only one word changes), overlapping so using an average score is most reasonable. The Affective Learning Scale measures current emotions and positive internalized attitudes toward content, a temporary condition of intention to complete a task, and a positive belief in accomplishing a task. The measure above was chosen after reviewing studies that have been completed over the course of the last twenty years that profiled affective learning in educational settings [35, 36, 37]. Similar reliability (Cronbach’s alpha=.941) has also been demonstrated in the Kearney study [35] using the ALS. The reason for using this instrument was two fold: (1) this measure is reliable and has been tested multiple times using the same age group as the research study; and, (2) this measure looks specifically at affective learning as identified by Bloom as “an increasing internalization of positive attitudes toward content or subject matter” [35].

Independent Variables
The independent variables of this study were group membership (i.e., game, reading, and control group assignments) controlling for gender, hours playing video games at home, and pretest scores on the ALS. Students were asked to provide demographic information such as gender, age, number of hours playing video games, and volunteer experience with the homeless.
Control, Game, and Reading Group Assignments
Using matching protocols [33] classes were matched first by variables (e.g., grade, state, setting) and then randomly assigned to either the game, reading, or control group to ensure equivalency across the participant. This was done to ensure that an equal number of students were assigned to each of the control, reading, and game groups from each of the grades, states, and school settings. The matching failed over the course of the data collection due to classrooms dropping out of the study and students not completing the measures. This led to an unbalanced design with different amounts of classrooms in each group.

The game
Spent is a text based game developed by the McKinney advertising studio in cooperation with the Durham Homeless Coalition. The player starts off with a scenario that they are a single parent, have no job, and just lost their home. The gameplay starts when the player is challenged to see if they could survive on $1000 for the next month. After securing a job the player is faced with a series of choices including finding housing, paying for car insurance, joining the union, and buying food. Every decision has an effect on the player’s money barometer and the challenge is to make the choices you would normally make in your own life but on the limited financial means that the player currently has available.

The reading
Written in the first person this account is of the first night of homelessness and the experiences that lead to and follow from living on the edge of financial ruin. Published by the Huffington Post the author leads the reader through carrying all of their belongings, finding a safe place to sleep, getting a job interview, buying food, and applying for benefits. The reading level of this article is grade 5.

PROCEDURE
In the fall of 2011 9816 emails were sent to every school in Indiana, Ohio, Illinois, and Michigan asking principals to forward an email invitation to participate in the study. A total of 200 classrooms (n=5139 students) completed the study by June 2012. The researcher contacted each teacher that expressed interest in participating in the study via email in March 2012. Upon receiving the approval of the Institutional Review Board (IRB) the researcher began recruiting individual classrooms for the experiment to be conducted in the spring 2012. The researcher sent a hyperlink to each teacher to an online video that discussed the research procedures. Each teacher also filled out a Qualtrics™ survey with his/her preferred research dates, and pertinent demographic data about their students. Once the teachers watched the video and were instructed in the research procedures, they were assigned to game, reading or control groups. The researcher was not present to administer the study and teachers were given a detailed instruction sheet on how to proceed. Off-site research allowed access to larger research subject pools relevant to the research questions and allowed participation research at a site from which research would otherwise not be conducted. Critical elements such as fostering communication, encouraging subject participation, and optimizing data collection and management were handled through email, Qualtrics™ and online video.

A week prior to the research date, teacher participants received a reminder email with a basic survey that asked them to provide classroom data such as volunteer activities related to homelessness, how often they used computer games in their classroom, and subject area specialization, including whether or not they have talked about homelessness and any community service projects that the school is involved in relating to homelessness. This was used in the data conditioning process to determine if any outliers were the result of these individual classroom variables. The survey was in Qualtrics™ with multiple-choice and open-ended questions. This information was used to gain a clearer understanding of how the variables related to the school and classroom settings. Related to the research questions and the research by Lenhart et al. [38] the number of hours spent playing video games could have an effect on ALS scores. There is no prior research that examines hours playing video games at home and hours playing video games at school in relation to affective learning, thus the researchers hypothesize that these variables may have an impact and account for them in data analysis.

For game and reading groups, on the assigned research day the teacher escorted their class to the computer lab and started the study. Teachers read a brief introduction telling the students how to log on to Qualtrics™ and take the pretest, the length of time to play the game or read the story, and how to access the posttest. Each teacher received a short script to be followed for the treatment section and the follow up. Students logged onto individual computers and accessed the Internet. Each student received a slip of paper that had the URL listed for the game (www.playspent.org) or reading and the tinyURL (www.tinyurl.com) for the Qualtrics™ survey. First students took the pretest on Qualtrics™. They then played Spent or read a first-person narrative about being homeless for approximately 30 minutes. Then they accessed the Qualtrics™ survey site again to complete the posttest measure. The pretest and posttest measure asked for the students’ name, gender, school, state, and grade to ensure proper identification of the student on all three tests. To ensure confidentiality surveys were matched and de-identified by a third party not associated with the research study prior to any data analysis. This occurred for all research groups.

For control groups, on the assigned research day the teacher escorted their class to the computer lab and started the pretest. Students logged onto individual computers and accessed the Internet. Each student received a slip of paper that had the tinyURL for the Qualtrics™ survey. Students accessed the Qualtrics™ survey site to complete the pretest measure. Three weeks later the class returned to the computer lab on the assigned research day. Students logged onto individual computers and accessed the Internet. Each student received a slip of paper that had the tinyURL for the Qualtrics™ survey. Students accessed the Qualtrics™ survey site to complete the measure. The measure was made up of one scale. Participants in the game, reading and control groups took the
ALS. The treatment groups took the ALS immediately before and after playing the game or reading and the control group took the scale without playing the game. Each group completed the scale three weeks later to test for long-term sleeper effect.

**DATA ANALYSIS**

Hierarchical Linear Modeling (HLM) was chosen for the data analysis of the current study because the data were reported by students nested in classrooms, with the classroom receiving the assignment of control, game, or reading group. HLM is a multi-level multiple regression technique that is useful in analyzing nested data [39]. In order to proceed with HLM analysis, the number of levels in the data needed to be specified and models needed to be constructed. The current study data were best described in two levels: student level (level 1), and classroom and teacher level (level 2).

\[
\text{ALS Immediate Post Test} = \beta_0 + \beta_1 (\text{Gender}) + \beta_2 (\text{Hours Playing Games at Home}) \\
+ \beta_3 (\text{Hours Playing Games at School}) + \beta_4 (\text{ALS Pretest}) + \tau \\
\beta_0 = \gamma_{00} + \gamma_{01} (\text{Game}) + \gamma_{02} (\text{Reading}) + U_{0j} \\
\beta_{1j} = \gamma_{10} + U_{1j} \\
\beta_{2j} = \gamma_{20} + U_{2j} \\
\beta_{3j} = \gamma_{30} + U_{3j} \\
\beta_{4j} = \gamma_{40} + U_{4j}
\]

**Figure 1. Immediate Post-test Model**

\[
\text{ALS Three Week Post Test} = \beta_0 + \beta_1 (\text{Gender}) + \beta_2 (\text{Hours Playing Games at Home}) \\
+ \beta_3 (\text{Hours Playing Games at School}) \\
+ \beta_4 (\text{ALS Immediate Post Test}) + \tau \\
\beta_{0j} = \gamma_{00} + \gamma_{01} (\text{Game}) + \gamma_{02} (\text{Reading}) + U_{0j} \\
\beta_{1j} = \gamma_{10} + U_{1j} \\
\beta_{2j} = \gamma_{20} + U_{2j} \\
\beta_{3j} = \gamma_{30} + U_{3j} \\
\beta_{4j} = \gamma_{40} + U_{4j}
\]

**Figure 2. Three-Week Post-test Model**

Level 1 was represented by student background such as; hours playing games at home and at school, pretest score, and gender which are unique across students. Teacher and classroom background variables such as treatment grouping and grade level represented level 2.

**RESULTS**

Students in both the reading and game group increased their affective learning score immediately after treatment and both factors were statistically significant in their difference from the control group. While students in the reading group had .667 (p<.0001) points higher than the control group, the game group had a 1.57 (p<.0001) increase over the control group. This could be interpreted to mean that the game had a greater impact on affective learning and that it is the persuasive game mechanics of Spent, rather than the subject that relates to this finding.

The change from ALS pretest to ALS immediate posttest for the control group can be explained by carry over effect as these tests were taken back to back. The game group gained an approximate 2.4 points, which is a significant change. Additionally, the reading group gained an approximate 1.5 points immediately after treatment. The changes in scores may be explained by the fact that students had to travel to a computer lab and take part in a special assignment rather than the normal day-to-day classroom.

<table>
<thead>
<tr>
<th>Source DV: Immediate Posttest ALS</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>Approx. d.f.</th>
<th>P-value</th>
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<td>.059</td>
<td>197</td>
<td>&lt;.001</td>
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<td>197</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>READING</td>
<td>.667</td>
<td>.180</td>
<td>197</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>GENDER</td>
<td>.057</td>
<td>.048</td>
<td>2330</td>
<td>244</td>
</tr>
<tr>
<td>GAMES HOME</td>
<td>.011</td>
<td>.005</td>
<td>2330</td>
<td>.042</td>
</tr>
<tr>
<td>ALS PRETEST</td>
<td>.545</td>
<td>.199</td>
<td>2330</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

**Figure 3. Immediate Posttest results**

In summary the model as a whole is significant in predicting the immediate posttest score on ALS. Individual level 1 variable gender, is not a significant predictor of the immediate posttest score on ALS, but hours playing games at home and ALS pretest are significant predictors of ALS immediate posttest score. This may imply that the more hours students play games at home, the more they enjoyed and found interesting, the game Spent.

Overall, the reading and game groups showed a significant difference from the control group score. This may imply that immediately after treatment students felt that the activity was different and engaging compared to daily classroom activities. One thing that is not explained by the data is the lower pretest score for the control group. One possible explanation is the lower number of control group classrooms (n=24). An additional possible explanation is that teachers informed their students of the control group assignment and this affected the control group score.

Three weeks after the treatment the game group showed a significant difference, .736 points (p<.001) from the control group while the reading group did not, .102 points (p=.553). The practical significance of these findings is weak. One possible explanation for this finding is that after three weeks...
with no additional exposure to the game or reading the students were not as engaged or interested in the material. However, the game group is statistically higher than the control group on the ALS three-week posttest.

All three groups decreased in their affective learning scores but only the game group showed a significant change from the pretest to the three week posttest as measured by paired sample t-tests. This could be interpreted to mean that playing the game increases affective learning temporarily but the effect is not sustained over the long term. The reading group had a significant point difference from pre test to posttest but did not differ significantly from posttest to three-week posttest, as measured by paired sample t-tests.

<table>
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<tr>
<th>Source DV: ALS Week Posttest</th>
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<th>Approx. d.f.</th>
<th>P-value</th>
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<td>197</td>
<td>p&lt;0.01</td>
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<td>.173</td>
<td>197</td>
<td>0.553</td>
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<td>.987</td>
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<td>.008</td>
<td>3451</td>
<td>.241</td>
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<td>.008</td>
<td>.006</td>
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</table>

**Figure 4. Three-week Posttest results**

This could be interpreted to mean that reading about homelessness immediately increases affective learning and decreases but not in a significantly different way than the control group.

In summary none of the groups sustain their ALS score from immediate posttest to three-week posttest. However, the game group does score significantly higher on the three-week posttest than the control group. Both the reading group and the control group decrease to pretest level after three weeks and there is no significant difference between these groups.

**DISCUSSION**

First and foremost this study is significant because it is currently one of very few studies that empirically measured the persuasive effectiveness of a game aimed at a social issue and found statistically significant results. There are multiple anecdotal reports and case studies available on social issue games, but this is one of the first that took a large-scale quantitative approach to measuring affective learning using a publicly available social issue game. Additionally, the study used an empirical methodology that is verifiable with measures routed in valid and reliable statistical approaches. Simply stated, this study found statistically significant results within the protocols of the study, using parametric tests and reached conclusions that are supported by current literature.

Playing Spent or completing the reading significantly increased the affective learning score immediately after treatment with the game group scoring 1.57 points higher and the reading group scoring .66 points higher out of a score of 6. This finding showed that there is a significant impact on affective learning whether the students read or play the game. That in itself doesn’t relate significance, but what does matter is that the game group scored both significantly higher than the control group and almost a full point higher than the reading group in the immediate posttest. The data did support the prior research [9, 40] that playing the game would lead to a higher level of affective learning. Although subjects who were a part of the game group scored significantly higher than the reading group, the game group was not significantly different than the reading group. Both activities positively affected the affective learning score significantly over the control group. However, it is interesting to note that students in the game group increased two times over the reading group. One possible explanation for this finding is that the game elements and interactivity increased affective learning. Prior research supports this [2, 13, 22] and the students in the game group were experiencing the same content as the students reading in addition to the persuasive game.

Another potential explanation for the significant statistical and practical increase in scores on the ALS for the game group is that the pretest score was based off of subjects not having any prior experience with the game. Therefore the pretest scores were homogenously low across all groups and the game group was significantly different than the control group at the immediate posttest due to the game elements. The combined explanation of the prior research supporting an increase in affective learning and no prior activity resulting in low pretest scores indicates the differential impact of game play on affective learning over reading or control group scores.

This finding is both interesting and expected. It was expected that the students who played the game to be more engaged and affected than those who did nothing. What was unexpected was that students who read would not be statistically different than the students who play the game. However, it has been seen before in games research [41] where there is no statistical difference between groups when
measuring abstract concepts like affective learning.

All three groups affective learning score decreased from the immediate posttest, but the game group was significantly different from the control group in a positive direction. This means that after three weeks the students who played the game were still more engaged and motivated in the topic of homelessness than the students who had not played the game. While affective learning scores peaked at the immediate posttest and then went down during the three-week interval, the game group was still more positive than the other groups. However, while the reading group and control group decreased to pretest level the game group was significantly higher statistically than the control group after three weeks. One explanation for this finding may be that the mechanics of the game that initially increased the ALS score were sustainable after three weeks leading to a higher, albeit less peaked, affective learning score than the control or reading groups.

One possible interpretation of this finding is that the game Spent, with its persuasive mechanics, has a higher residual effect on affective learning when students think about homelessness. This more positive affective learning could possibly link to a more positive attitude towards the homeless. Prior research [42, 43, 8, 29] supports this finding. Practical significance of this finding links to the statistical significance. Students that are more engaged and motivated by the game immediately after playing are able to sustain that engagement and motivation in the topic of homelessness over the course of three weeks. Games can manufacture psychological changes as shown here and supported by the work of the above studies as well as Foster & Mishra [44] and Mishra & Foster [45].

In the big picture this study was both statistically and practically significant in the field of measuring persuasive games. This is a first step in a barren area of research and for that reason alone this study will open up new paths to future research. All of the major findings were statistically significant with a solid methodology and research framework that created a replicable study that can be used with any persuasive game that fits the criteria discussed in the introduction. Moreover, this study is the first step on lining up more research on this process. Moving forward is the key to the utility of this study and lessons learned during the process will help further this field of research.

This study examined the effects of playing a persuasive game on affective learning. Data were collected from 5139 middle and high school students across 200 schools in four states. The treatment conditions were randomly assigned to each classroom after matching and included a control group (only took the tests), a game group, and a reading group each within a Solomon design (no pretest for half the participants). There were statistically significant positive changes to the game group after three weeks, a first step in closing the gap that exists in persuasive game research.

CONCLUSION
Games about poverty and homelessness are creating opportunities for new conversations about social issue awareness in the global community [46]. Games such as Spent, designed to demonstrate that homelessness is a matter of circumstances and not character, take an interactive approach to raising awareness about major issues in our society. Homelessness is not declining in the United States and awareness through education, whether formal or informal, without explicit instruction needs to rely on other mechanisms. Persuasive mechanics in conjunction with game elements can provide motivation for players to actively engage in social issues through gameplay. As demonstrated in this study, active engagement can lead to a change in affective learning and could, in the future, lead to a change in behavior. We do not yet have the empirical evidence to suggest that Spent and social issues games can provide impetus for action, but we are getting closer as a games community. In a world where poverty and homelessness are becoming more prevalent and inaccurate stereotypes about the poor still abound, it’s important that we find ways to measure the impact of social issue games.

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REFERENCES


