Game Based Teaching for Your Health: Testing a Board Game, Monster Appetite, for Classroom Implementation

Introduction

Games possess the powerful features for engaging learners and sustaining interest. In 2013, US consumers spent 21.53 billion dollars on the game industry (ESA, 2014). Games are increasingly becoming a huge part of people's pastime, which have led educators to consider integrating gaming into different (in)formal learning environments (Dede, 2005). Since most players are intrinsically motivated to play a game, the longevity and success of game integration lie in game design and content.

The pivotal role of instructional design through games is to make sure that it promotes learning (Collins, 1996). Games should be designed so that the content and skills sought are clear, well structured, and executed efficiently. Furthermore, games should prepare learners to do the kinds of complex tasks that happen in real life. With this, Collins suggested that educators must understand the tradeoffs in the learning process of using educational technologies. For example, games may compromise seriousness and relevance to learning, if educators cannot clearly show their students the learning aspects embedded in the gameplay. Hence, the goals of using game-based learning (GBL) would fail. Therefore, it is important that game designers and educators should balance these cognitive and reflective considerations and are properly trained and exposed to game-based curriculum (Katelhut & Schifter, 2011).

Problem Statement and Objective

Educators should first be exposed to potential classroom games before they are used with their student body (Becker, 2007). In this way the educators will have time to consider cognitive and reflective learning aspects that the game can afford. Unfortunately, nutrition in particular is

not mainstream in schools and therefore not much time is dedicated for preparation, let alone time for research in good nutrition games.

From the 70s through 90s the perceived importance of nutrition education increased tremendously because healthy eating patterns from early on promote growth and intellectual development (Stang et al., 1998; CDC, 2014). Now nutrition education is considered a necessary component for health promotion and establishing a healthier lifestyle. Research shows that teachers are more likely to integrate nutrition in their courses if they have received nutrition training (Olson & Moats, 2013). Many policy makers are advocating for a full integration of nutrition education into… schools (IES, 2011; Jukes et al., 2007). Such full integration calls for appropriate training and preparation if a program were to be implemented in an educational setting. Currently, most public schools integrate three to six hours of nutrition education per year (Henderson, 2004) and teachers express the *lack of training and curriculum resources* as a huge barrier to integrating nutrition into curricula (Woodson et al., 1995).

Monster Appetite (MA) intends to address the above concerns by empowering the teachers as the main conveyor and advocate for healthy eating behaviors through a GBL environment. For this pilot, the researcher tests the self-created board game MA with 16 educators to see the potential of such a game for nutrition education. The pilot explores four main aspects in an exploratory fashion: fun and engagement for individuals and groups; social interactions; knowledge gain; and re-playability in classrooms (Xu et al., 2011).

Theoretical Framework

The most unique aspect of MA is its subversive approach for gameplay, which encourages players to make the conventionally "wrong" or unhealthy choices. This subversive approach of showing the negative consequences of a choice is based on the behavioral

inoculation theory in which the dangers and disadvantages of a specific undesired behavior is shown and experienced in order to confirm the behavior's ill-conceived preconception (Etheridge, 2012; McGuire, 1961). As MA employs monster avatars that show the results of high-caloric intake, the consequences of careless eating and energy intake are visual and realistic. The inoculation theory fits well with MA because it provides the player with the experience that normally is highly discouraged in real life. One of the best affordances of games is that this type of experimentation can be done freely without real world negative consequences (Gee, 2007; McGonigal, 2011). MA affords players to explore, experiment, play, and fail as many times as they wish while simultaneously viewing the consequences of high caloric intake via the avatars. The inoculation theory frames MA and this pilot captured the critical reception of the game concept and design as a potential tool to be used in different learning environments in the future.

Methods and Data Sources

The study was designed to explore how educators interact and learn from one another while playing MA and record the participants' player experience. In other words, the study investigated whether learning can occur through gameplay in various forms (e.g., collaboration, strategic planning, reflection, engagement, inquiry) and whether the specific nutrition game content of MA is intriguing for educators to consider implementing into their learning environments.

Sixteen (N=16) K-16 educators (12 females and 4 males) from two East Coast cities participated in the study. Four dependent variables were studied: self-reported fun and engagement of the participant and of the entire group playing the game; social interactions among participants; knowledge gain; and re-playability in classrooms. In addition, qualitative

feedback through questionnaires and interviews was collected. There were no treatment or control groups and purposeful sampling was used. There were a total of six separate 1-1.5 hour-long sessions with a total of three to five participants at any given time. All sessions were video/audio recorded for data analysis and capturing of social interactions. Semi-structured interviews were transcribed for analysis. All other data were retrieved via *Qualtrics* and analyzed via SPSS.

Results

Participants gave high mean scores for their fun and engagement while playing MA (M_f=8.19, M_{eg}=8.94) as well as their perception of the group's fun and engagement (M_f=8.19, M_{eg}=8.94).

[Insert Table 1]

Majority of the participants rated fun and engagement equally for themselves and the group.

The social interaction category included chores, reflection on gameplay, strategies, out-of-game and game itself (Xu et al., 2011).

[Insert Table 2]

The video data were analyzed to tally the frequency of different aspects of each social interaction expressed during gameplay.

Knowledge gain was measured with a Pre- and Post-Test. The test only asked if a food had higher calories per serving than another similar item with an option to choose '*The Same*' or '*I Don't Know*.' A *t*-test and between paired samples test were conducted.

[Insert Table 3 and 4]

The participants' correct answers increased from Pre- (M=7.88, SD=4.36) to Post-test (M=12.50, SD=2.19) with statistical significance; $t(15)=-4.45$, $p<0.001$.

Fourteen participants stated they would play MA again if the opportunity were given. Two participants chose ‘maybe’ on re-playability and elaborated that if certain game mechanics and language(s) were adjusted to tailor to their students there was potential for the game to be used in a learning environment.

The most unexpected, yet frequent evaluation drawn from interviews was about the game length. The majority of the players commented how the length of the game was ideal for classroom implementation as it took approximately 30 minutes with a clear ending, leaving room for discussion and reflection for one class period.

Discussion and Significance

The current study was designed to learn and capture participants’ player experience including fun, engagement, and social interactions; knowledge gain in identifying high versus low caloric foods; and re-playability in other learning environments that can encourage discussions on nutrition topics.

Fun and Engagement

Self-reported fun and engagement for each participant as well as the entire group evaluated by each individual was fairly high. An interesting trend was that the majority of the participants reported the level of fun and engagement for themselves the same as what they thought the entire group experienced. Since these questions were asked one after another the researcher suspects question order biases could have been in effect. The Post-Questionnaire revealed that some causes for such high scores as appropriate game duration, rules that brought about humor and excitement, and unconventional design and content that encouraged people to pay attention to specific aspects of food consumption.

Social Interaction

'Collaborative Learning' behavior under 'Chores' was relatively low. Though the researcher expected to see some of these behaviors occur naturally, most sessions showed low frequencies (see Table 3). The fast-paced nature of the game is one possible reason: because there was not a set time to share all selected food items and their calories, many utterances of food topics were left without a follow-up conversation. If there were an allotted time for sharing caloric information, more natural collaborative learning behavior could have been expected. Therefore, this pilot's results have implications for game designers of thinking of a time where the individually acquired knowledge is brought together as a group within the game structure.

Because of the fast-paced nature of the game, there was not a prominence of 'Reflection of Gameplay' except the behavior 'Making one's move and laughing about it.' This was a consistent observation with all players in all gameplay sessions. This trend is not surprising as the subversive approach was implicating socially undesired behavior as "good." Participants did not hesitate to share their 'Strategies' when asked during the semi-structured interviews. This shows how post-discussions after gameplay could benefit all players in learning each other's strategies. Participants who had the opportunity to listen to other people's strategies expressed how informative it was and how it could help them strategize better in the future if they were to replay the game. In addition, by sharing strategies the participants had another opportunity to learn about what indicators could help them identify high versus low caloric foods.

Knowledge Gain

Knowledge gain showed significant increases from Pre- to Post-Test. Some comments during gameplay indicated instances of learning. A participant shared with his group that he realized anything liquid or liquid like (e.g., salad dressings, jams, condiments) has low calories

because the serving size was always small. The group reacted to this comment and all avoided choosing anything regarded as a liquid item. Another participant simply stated that she felt like she was learning something and did not expect that from playing a game. These were all positive qualitative comments illustrating instances of learning. Some participants showed regret that the learning was limited to calories and not other nutrition information such as fat, protein, or fiber content, while others appreciated that the learning was specific and focused.

Re-Playability in Classrooms

The majority of the participants showed desire to replay MA in some learning context in the future. There were suggestions from participants how the game could be modified to cater to the specific students that would be playing the game in their classes. For example, two kindergarten teachers expressed that the high numbers for the calories might be difficult for their students to understand. Therefore, if the game were to be utilized in their classrooms they would implement a simpler scale to express high and low calories. In addition, some participants mentioned how this could be useful in a math class as addition/subtraction are involved. If students had to calculate the calories of the entire package of a food, multiplication and proportion could be introduced. A future study could involve knowledge gain in math/computation concepts using this game.

The main reason why most participants saw this game being employed in a classroom setting was due to the relatively short game length. Many commented how the length of the game was ideal to be played in one class period with a clear conclusion. With an average of half-an-hour gameplay it leaves room to discuss the game's message and nutrition concepts to be covered. The fast-pace, subversive approach, competition, chance cards, and monster avatars

were also mentioned as useful mechanics and features that could draw attention to students in a learning environment in a fun and engaging way.

There is potential for this game to be recycled for different audiences and contents. With technology incorporation there are various ways that the game can become more engaging and informative for learning. Four dependent variables (fun and engagement; social interactions; knowledge gain; and re-playability in classrooms) were explored and observed during gameplay as predicted. Overall, the pilot was successful and informative for the researcher and this can be a stepping-stone for a more improved future study.

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Tables

Table 1. Fun and Engagement Individual vs. Group

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Fun_Individ	16	5	10	8.19	1.328
Fun_Grp	16	5	10	8.19	1.377
Engage_Individ	16	5	10	8.94	1.289
Engage_Grp	16	7	10	8.94	1.124
Valid N (listwise)	16				

Table 2. Social Interaction Tally Sheet Count and Average of Counts

	24-Jun	10-Jul	14-Jul	15-Jul	18-Aug	24-Aug	AVG
CHORES							
object maneuvering	7	0	0	14	0	0	3.50
discussion while waiting for turns	3	0	7	0	3	14	4.50
enforcing rules via social agreement	8	7	9	14	13	7	9.67
collaborative learning	3	2	3	3	3	8	3.67
REFLECTION ON GAMEPLAY							
making a move & laughing about it	7	17	7	7	7	27	12.00
discussion referring back to past moves	2	0	8	3	0	0	2.17
discussion on the whole game	1	0	1	0	1	7	1.67
discussion on improving/changing current game mechanics	1	1	2	7	0	0	1.83
STRATEGIES							
talking about the strategy	1	0	1	0	0	1	0.50
pointing at obj to discuss the specifics of a move	2	2	2	4	1	5	2.67
negotiating & changing strategies according to game state	4	0	0	3	0	0	1.17
OUT-OF-GAME							
talking about out-of-game subjects	2	3	1	1	1	4	2.00
reacting to distractions	1	3	0	0	1	1	1.00
between-session/round casual chat	0	0	0	1	0	6	1.17
GAME ITSELF							
commenting on the rules and setup of the game	3	24	33	14	17	29	20.00
joking abt (reacting to) the game lang/mechanic/rules	14	17	13	9	14	19	14.33
talking food ingredients	7	27	13	10	17	19	15.50

Table 3. The Mean Pre- and Post-Test Scores

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PreTest	7.8750	16	4.36463	1.09116
	PostTest	12.5000	16	2.19089	.54772

Table 4. Paired Samples Test

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
PreTest PostTest	-4.62500	4.16133	1.04033	-6.84242	-2.40758	-4.446	15	.000