Using a Table Top Role-Playing Game Assignment to Enhance Student Learning

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ABSTRACT/INTRODUCTION

Does the use of table-top Role-Playing Games (ttRPG) enhance the student learning experience and the achievement of course learning outcomes? Our paper contributes to a small but growing literature on the effectiveness of ttRPG design and play as a means of achieving course learning outcomes. Our case study and survey results are drawn from our use of a ttRPG in our second year, team-taught, interdisciplinary course on "Global Issues in the Arts and Sciences" taught at UBC since 2008. This course integrates concepts across the social sciences and humanities and the physical and life sciences, through an exploration of climate change and human genomics.

In the literature, ttRPG assignments are credited with facilitating a longer lasting understanding of material because their design and play requires students to actively engage with the subject matter, and because students feel an intrinsic motivation to succeed in their roles. In our paper we emphasize the learning value of game creation over gameplay. When students create the games they play, that creative process deepens the learning value of the assignment. To determine the impact of our ttRPG assignment on the student learning experience, we conducted surveys of the students enrolled in our course. The survey results suggest the ttRPG assignment was successful in enhancing student learning outcomes. However, like simulations, games are considered engaging and fun. This may exert a positive bias on student responses, exaggerating learning impact measures. This a consideration for both current findings and

future studies. Overall, our findings suggest that ttRPGs have a positive influence on student learning outcomes, but greater learning value may come from game creation.

Role-Playing Games in the Context of Active Learning

There is growing interest in the use of active techniques to support learning processes. Active learning includes methods such as classroom simulations, games, role-play exercises, and flipped learning models. (Ishiyama, 2003; Indiana University Bloomington, 2004; Randi and Carvalho, 2013). Active learning practices are built on the principles of student-centered learning and are credited with engaging students in ways that traditional techniques (such as lectures) cannot. There is limited research on the effectiveness of active learning exercises and there is a call for more emphasis to be placed on evaluating the results of these techniques (Gosen and Washbush, 2004; Krain, 2005). Critics argue there is not enough evidence to support claims of positive impacts, especially given the heavy emphasis on student attitudes garnered through surveys (Shellman and Turan, 2007). However, there is increasing empirical data to support the positive impacts of active learning. In an assessment of active learning techniques in comparison to traditional methods, active learning was found to better promote student understanding. In contrast, lectures were found to be the least effective (Hackthorn et. al, 2011). This study contributes to the existing literature on these topics by exploring the use of table-top role-playing game design and play to enhance learning in an interdisciplinary setting.

The effectiveness of interdisciplinary education itself is also contested. Interdisciplinary education is defined as the "integration of knowledge and modes of thinking and expertise to produce a cognitive advancement - such as explaining a phenomenon, solving a problem, or creating a product – in ways that would have been impossible or unlike through a single means" (Boix Mansilla et. al, 2000). One of the most important outcomes for interdisciplinary education is the understanding that a single perspective cannot be used to effectively understand and explain real world problems (Harris and Hatley, 2004). Interdisciplinary learning has been shown to produce higher level cognitive processing, critical thinking, metacognitive skills, and epistemological development (Ivanistakya, 2002). As a result, interdisciplinary education is able to promote the ability to apply knowledge to real world situations (Styron, 2013). However, critics point to the 'pot pourri problem', in which students obtain a less in-depth understanding of content as a result of the attempt to encompass a wide variety of subjects (Jacobs, 1989).

Simulations and games are closely related in the educational literature on active learning (Nygaard, et. al. 2012). Simulations are a form of active learning which encourages students to apply class material and practical skills to real world problems (Andreu-Andres & Garcia-Casas, 2011). John P. Hertel and Barbara J. Millis defined simulations as "…sequential decision-making classroom events in which students fulfill assigned roles to manage discipline-specific tasks within an environment that models reality according to guidelines provided by the instructor." (Hertel and Millis, 2002). Simulations are credited with facilitating the improvement of skills such as interpersonal communication, teamwork, leadership, decision-making, task prioritising, and stress management (Flanagan, 2005). Simulations also show varied impacts across different

areas, such as student performance, engagement, and learning motivation. One of the primary challenges in evaluating the effectiveness of simulations is a lack of empirical evidence demonstrating their ability to meet learning objectives. There are a number of additional issues associated with simulations, including challenges with balancing educational value and entertainment, and difficulty tracking student progress. Teachers and organizers cite further barriers to implementation including the time required to plan and implement simulations, and lack of available plans or examples (Kim et. al., 2018)

Like simulations, role-playing games are credited with facilitating a longer lasting understanding of material than traditional lectures (Monahan, 2002). This is because their design requires students to actively engage with the material, in order to utilize the information in their role. This form of active learning encourages students to 'learn by doing' and to reflect on their actions, which can have a lasting impact on learning, along with enhancing the development of thinking and writing skills. Role-playing games also emphasize identification with a character in a created social setting, providing a wider opportunity for imagination and interpretation (Wills, 2012). Furthermore, role playing games are often perceived by students as being more engaging, as they feel an intrinsic motivation to succeed in their role (Pettenger & Young, 2006). However, role playing games require considerably more time for students and faculty, and therefore are sometimes seen as being too time consuming to be worthwhile. There is also the fear that students will misinterpret class material, and as a result, will work through the game based on misunderstood information (Paschall and Wüstenhagen, 2012).

Our Arts Science Integrated Course (ASIC) 200: Global Issues in the Arts and Sciences

Our Arts Science Integrated Course (ASIC) 200 is a second-year course offered once a year at the University of British Columbia (UBC) since 2008. The course title is "Global Issues in the Arts and Sciences" and the two core subjects covered in the course are climate change and human genomics. The fundamental philosophy of the course is interdisciplinary in character: the global issues of our time cannot be fully understood without a basic level of awareness and literacy in both the physical and life sciences and the social sciences and humanities. The course is team-taught by two faculty members, one with a PhD in Immunology and the other with a PhD in Political Science. The course enrolls students from both the Faculty of Science and the Faculty of Arts, and counts as the lower level science degree requirement for Arts students, and the lower level arts degree requirement for Science students. The course is therefore deeply interdisciplinary, not only in content but also in the composition of the teaching team and student enrolment. The course meets once a week in the evening for a three-hour period for thirteen weeks (the standard UBC term).

From its inception, ASIC 200 has employed active learning techniques, primarily in the form of two "laboratory" components, one for each discipline. Our motive for including these components was based on the challenges of interdisciplinary teaching: how could we get students in Arts and Science to explore and synthesize the content and concepts of "other" disciplines across the Arts/Science divide? Our answer was active learning, which across

disciplines shows that students learn more by “doing” and “saying” things than by reading and listening (Stice, 1987; Boyer et. al. 2000). The social science lab is a climate change simulation based on the 2009 Copenhagen Climate Change Conference. The simulation is a full class (three hour) exercise conducted during the climate change section of the course, featuring students working in groups to represent the key countries seeking to reach agreement on a new global climate treaty. The science lab is a Polymerase Chain Reaction (PCR) test. The lab is a full class (three hour) “wet lab” conducted during the human genomics section of the course, featuring students using their own samples. Together, these two components provided students with an opportunity to apply key concepts and knowledge and recreate complex processes (Woodworth and Gump 1994). Both the simulation and the lab provided extensive peer interaction and peer learning opportunities.

Despite the inclusion of these labs, we remained dissatisfied with the amount of time still expended in content-delivery lectures. We were also aware that both labs were one-class affairs, and compartmentalized the major active learning components of the course. We wanted to provide students with a more immersive and iterative learning experience, which allowed them to analyze and apply course content in an original and creative project spanning a number of weeks. We wanted students to be able to achieve these desired outcomes individually and cooperatively, and we wanted to use these projects in a capstone class learning activity so students could learn from each other’s efforts, rather than have the projects vanish onto our desks for grading purposes, never to be seen again. To achieve these desired outcomes, we chose to develop an assignment that required students to design a role-playing game. The game is set on an Earth one hundred years in the future, created by the students based on current trends identified in the physical and life science and the social science and humanities literature, accessed through course instructional videos, readings, and their own research. Students then design a scenario (or adventure) within this future Earth along with a team of adventurers (or characters) that players can role-play to solve a mystery or attain an objective. On the last day of class, students play the games. We elaborate on these learning objectives below, and discuss the specifics of the assignment in the next section of this paper.

One primary learning objective of the role-playing game assignment is to increase student engagement with the course subject matter (climate change and human genomics) through the application of the concepts and knowledge in the course materials, and their own research (Raines 2003). We wanted students to analyze the content they were learning in order to enhance retention and comprehension, but more importantly to explore that material in greater depth. Designing a role-playing game set in a future Earth based on current trends and models requires students to delve more deeply into the subject matter. Students must navigate and evaluate the course materials and the broader scientific and academic literature to find the evidence-based foundations for “their” future Earth. We also wanted to promote student engagement through an assignment with both individual and social (group work) components. And we agree that “[p]lay and games create a world of “as if” that is interactive and exciting.” (Nygaard et. al. 2012)

A second learning objective of the assignment is to encourage students to animate content and concepts in the course, to apply what they are learning to a new purpose through reasoning and problem solving. To "construct" a future Earth and then create an adventure script and characters within that world is a demanding creative exercise that combines the course content with student agency: they get to design "their" world, populate it, and develop a narrative within it. A corollary of this animation of content and concepts is the connection forged between the students themselves and the course material: the future world they design could plausibly come to pass close to their own lifetimes, and certainly within those of their children. In this way, the exercise encourages students to think about the long-term future implications of climate change and advances in genetic knowledge and technology, and to reflect and relate to it on a personal, rather than purely abstract, level. Games make it possible for students to reflect on their future, and provide an opportunity for students to imagine the possibilities of the future, and their own potential to make a difference in those futures. "Play is a profound engine of change." (Nygaard et. al. 2012)

A third learning objective is to encourage students to synthesize learning materials and academic work across general disciplines and, in particular, across the physical and life sciences and social sciences and humanities. We wanted students to have an opportunity to escape the disciplinary silos that characterize so much of modern higher learning with an interdisciplinary assignment that required them to include both "science" and "arts" concepts and content. By designing a future Earth based on evidence-based trends in both the physical and social worlds, students not only discover the relationships and interactions between the two, but also actively seek to combine and apply them in their own game design.

A fourth learning objective of this assignment is a familiar one, but with a twist. We wanted to provide students with an opportunity to further develop a wide set of capacities and competencies, particularly with respect to research, writing, analysis, and originality. In addition, our intent was to encourage the development of capacities related to peer-to-peer learning, group management and collaboration, and technical and creative writing for general audiences. These objectives are consistent with the objectives of simulations and role-play in higher education, including complexity, communication, creativity, conflict management, and commitment to action (Duke and Geurts, 2004; Guerts, Duke and Vermeulen, 2007). We also believe the assignment facilitates an additional, unique competency: the translation of complex scientific and social phenomena into compelling, accessible narratives. This increases the ability of students to act as science and social science communicators, both at university (where we hope they will become champions of interdisciplinary education) and beyond (where we hope they will be life-long contributors to a dialogue among and between physical and life sciences and the social sciences and humanities).

The Table Top Role-Playing Game Assignment

Formulation of this game-based learning assignment was largely inspired by the work of Dr. Kip Glazer. Glazer wrote her dissertation on the use of table top role-playing game design as a way

to broach the exploration of complex literature pieces within a high school English setting (Glazer, 2015). Here, she stressed the value of game creation over gameplay when addressing intricate and multifaceted topics. Game creation would encompass active learning activities and take advantage of valued elements from cognitive apprenticeship and constructionist pedagogical models. Essentially, we believed this particular genre of gaming would be perfect for our course, as it provided opportunities for students to construct evidence-based future global outcomes (a setting), as well as inhabit/roleplay characters with generated backgrounds that enabled immersion into unfamiliar perspectives (scenario and characters). Under this schematic, this afforded a pedagogical strategy that prompted the students' exploration of some of our key learning objectives: in particular, the comprehension, active usage and interdisciplinary scrutiny of the course's science and social science content; and an opportunity for students to roleplay/experience and therefore appreciate potential nuances in unfamiliar academic viewpoints.

In general, gameplay for ttRPGs is akin to an improvisation storytelling situation where players roleplay specific characters in a particular scene or combination of scenes (often called a *campaign*). However, the overall narrative and control of what actually happens is governed by one special player often called the game master (or GM). Essentially, this player has access to all the background information of the game and is therefore able to present situational information as they arise. In essence, the GM determines what happens when characters interact with the scenes, although this is also partly influenced by the characters' skills (what they are capable of), as well as a random component determined by rolling dice. A full game would see the players work through the campaign towards a discernable goal or ending. The most famous example of this genre of game is Dungeons and Dragons, although obviously in our case the setting is less about a fantasy realm but more about an evidence-based future projection of our planet.

As the creation of this type of game constitutes a significant amount of time and effort on the students' part, we have flipped the course's lecture components (to video) to offset this time requirement. By doing this, we are able to devote approximately half of the total number of class hours (~18 hours) towards a structured and primarily student-led game design approach. This approach can be largely categorized into four main components.

1. Familiarization with the ttRPG genre

As we have found that most undergraduate students are unfamiliar with this type of gameplay, we provide an opportunity for them to experience a ttRPG campaign in class. This is usually an adventure that was previously designed following the assignment's rubric (the course website provides this resource). Here, a team of students will control a single character, such that multiple characters are controlled by multiple teams and therefore provide a mechanism for inclusion of all students in the game. The role of the GM is covered by the course instructors, whose primary job is to familiarize the students with the improvisation nature of the game, as well as some of the dice rolling mechanics adopted. In this manner, this helps students better visualize what their final ttRPG assignment may look like.

2. World Building

In ttRPGs, the setting of the game is a crucial component. Therefore, one major aim of the assignment is that students will work in their teams towards the world building of a setting for their game. This part of the assignment will lean heavily on the course content (the science and social science of climate change and genomics) as a springboard, and will ask students to focus their research on a specific locale. Note that the world building component of this assignment is, itself, split into two standalone reports that are handed in for marking, with each one representing a third of the assignment's mark.

The first report asks students to focus on their locale's physical and geographical features. Here, students work alone and adopt one of the IPCC prescribed emissions scenarios to extrapolate a possible climate and environmental outcome, as seen approximately 100 years from now. This projection must be grounded on evidence-based peer reviewed literature research, such as those highlighted in climatology research papers, and/or credible governmental/non-profit reports. This projection summary will be both marked, as well as used as background for the student to share their ideas to the rest of the team. From there, the team will use class time (3 hours) to discuss their different projections, and then work to agree to combine their efforts on one specific locale and one specific emission scenario for their final ttRPG.

Once these parameters are agreed upon, and the physical outlook for their setting is determined, the second report will ask students to independently envision possible genetic technology advances and their resultant biological enhancements and/or problems (human or other forms of biodiversity). This second report then requires the student to create a picture of human society in this future world, where the impacts of climate change and genetic technology are acknowledged in evidence-based ways; this is such that there is credible speculation on what the resource, civil, economic, political, cultural, technological and environmental stressors might be. This also includes a brief summary of the local history that provides some narrative rationale for the 100-year projection. Again, this report is handed in for marking, and again is used by the student to share their ideas with the rest of the team. And once again, the team will use class time (3 hours) to discuss their different projections, and then work to agree to combine their efforts on one specific set of societal circumstances for their final ttRPG.

In all, these two group designed reports should paint a detailed setting of their game, in both physical and societal contexts, and in a manner that is heavily dependent on their need to immerse themselves deeper into the course's core content.

3. Campaign design

Next, students are asked to work in their teams to construct a scenario or narrative that can be "played" in a three-hour sitting (i.e. a *campaign)*. This involves the creation of a storyline that

enacts a series of events or challenges and a final end goal. This campaign, including its challenges and goals, needs to be fully immersed in the details assigned by the world building steps. Students will also need to design playable characters that are examples of members of this future society (human or human-ish as the case may be). These designed characters will have skillsets, specific personality traits and/or hidden agendas that feed into the storyline and the setting. Designing characters offers an opportunity for players to work with archetypes that are unfamiliar in their usual academic setting (i.e. the arts students create and plays a science-themed character and vice versa). We provide 6 hours of class time for students to work on this, whilst instructors circulate and provide feedback. The document that presents the campaign and its accompanying character descriptions is handed in for marking and is worth the final third of the mark.

4. Playing the Game

Course scheduling has been set up such that one 3-hour class session at the end of the term, will be provided for students to play their designed ttRPGs. Here, each group of students, save one who will remain with their own game as the GM, will rotate to another game. In this way, students will be able to both receive feedback on their own game, as well as have an opportunity to experience another. This component of the assignment is not evaluated but is rather provided as a reward for the students' effort.

Evaluating the Table Top Role-Playing Game Assignment: our Survey Findings

Our survey findings are represented on a five-point Likert scale, corresponding to individual attitudes; 1 is "strongly disagree", or strongly negative, and 5 is "strongly agree", or strongly positive. There were 27 respondents to our survey. Table 1 shows the average distribution of student responses during the ttRPG . The means and medians per question are between 3-4.5 and 3-5 respectively, and the majority of the distribution are between 3-5. Coupled with a mode between 4-5, these findings indicate positive attitudes towards the assignment's enhancement of the course learning objectives. Two parts of the game play stage contradict the positive attitude: the conceptual understanding and critical thinking and analytical skill enhancement sections. While the mode is ranked at 4, the distributions range between 2-4 or 2-5. The larger proportion of rankings of 2 suggests that conceptual understanding and critical and analytical skill enhancement were not as enhanced as in previous stages. This finding is unsurprising due to the nature of the ttRPG game play. Both the world building and scenario design stages encouraged students to apply knowledge and create a future Earth and narrative; these activities fall under constructionism, where students synthesize information through instructional activities (Glazer, 2015). Knowledge application is accepted as indication of deep conceptual understanding, so these sections would have emphasized greater conceptual knowledge and critical thinking (Zoller, 1993). Unlike earlier stages, the gameplay section focused on enjoyment and accomplishment of the final product (Figure 2). It is then unsurprising this section would be less learning-intensive. Written student responses agreed with greater learning during the world building and scenario design stages. As some students

wrote, the stages “made [them] read current research on the physical and social sciences … [meaning] that [they] not only learned the class material but was also able to explore other topics” and helped “[them] put the course content into context”. Despite the game play stage findings, Table 1 suggests that the assignment generally enhances students’ conceptual understanding of course material, critical thinking and analytical skills, soft skills, and interdisciplinary knowledge.

Tables 2 and 3 outline specific subgroup comparisons during the ttRPG assignment. Table 2 compares Arts and Science students in four sections of conceptual understanding: social science concepts of climate change, physical science concepts of climate change, social science concepts of personal genomics, and physical science concepts of personal genomics. As expected of a larger sample, Arts students had a larger distribution relative to Science students. Regardless, both groups showed similar means, medians, and distributions. Means and medians generally differed by 0.5 units, and most responses ranked between 3-5. The gameplay section was an exception, where the distribution ranged from 2-4; this was part of the learning trend discussed above (Table 1). The findings suggest that neither Arts nor Science students had a faculty-specific advantage in learning social or physical science concepts. Given that ASIC 200 is both a second-year course and a niche subject, we infer that students would not have had sufficient course experience to have a knowledge advantage.

Table 3 measures the differences between individual and cooperative learners. The means and medians between learners are similar, both generally differing by 0.5-1 units. The distribution of responses ranged between 3-5, with the exception of the scenario design stage. Individual learners had a wider ranking distribution of 2-5; this contrasts with cooperative learners, whose responses mostly clustered between 4-5. This finding suggests that cooperative learners felt that the scenario design stage was more beneficial to learning social and physical science concepts. The game play stage shows a similar observation for cooperative learners. 50-60% of cooperative learner responses were consistently ranked 4, relative to 15-42% of individual learners. These findings reflect the characterization of cooperative learners, who use positive interdependence and teamwork to achieve a common goal (Hilk, 2013). Both scenario design and game play stages are group activities which emphasize interdependence and collaboration. Especially at the game play stage, collaborative multiplayer games like the ttRPG enhance skills like peer-to-peer and collaborative learning (Goodwin-Jones, 2005). Therefore, cooperative learners would experience more learning benefits from these activities than individual learners. The results from Table 3 generally suggest that cooperative learners could benefit from the collaborative aspects of the ttRPG.

Table 4 compares the distributions of students with no ttRPG experience with those with prior experience. The means and medians of both groups show little difference; the differences between the groups range from 0-0.5 units and 0-1 units, respectively. While the distribution for those with prior experience mostly clustered between 4-5, students with no ttRPG experience often had a larger distribution of up to 2-5. This finding is expected, as students lacking ttRPG experience would be unfamiliar with ttRPG creation and game dynamics. The unfamiliarity would account for the wider range of responses in Table 4. Regardless, most

responses from students with no ttRPG experience were 4-5, indicating positive attitudes. The high proportion of positive attitudes suggests that the assignment enhances conceptual learning irrespective of ttRPG experience. However, there appears to be an added learning benefit for students with previous ttRPG experience. 57-67% of students with previous ttRPG experience ranked 4 for conceptual understanding enhancement during the game play section, unlike 25-35% of those with no experience. This finding could be explained by ttRPG familiarity. Students with no experience would likely focus more on game mechanics, leaving less time to focus on conceptual learning. Students with previous ttRPG would instead have more time for conceptual learning, and thus experience greater conceptual understanding. Despite the observation, the overall findings from Table 4 suggest that the ttRPG assignment enhances conceptual understanding regardless of ttRPG experience.

Overall student attitudes towards the ttRPG assignment are examined in Figures 1 and 2. Figure 1 measures the frequency of student attitudes on a five-point scale, as described earlier. Most students typically assigned responses as 4 or 5, indicating positive or very positive attitudes towards the assignment overall. Most students noted that the assignment was unconventional; but as one student wrote, the assignment "was extremely enjoyable and a very novel and interesting way to explore and learn more about the topics …". The findings indicate that students enjoyed the ttRPG, gained better understanding of course material and associated perspectives, and felt positively towards its use as a learning tool. From these findings, we can infer that the ttRPG was successful in enhancing the course learning objectives and goals.

Figure 2 shows common themes from written responses. Attitudes about the ttRPG are broadly positive, with students stating that motivation, optimism, contextualization, and interaction were positive aspects. The positive themes suggest that the ttRPG increased engagement and course interest, made course content more relevant, and was fun, in addition to increasing interdisciplinary knowledge. An example of increased interest was in the world building stage; many students cited this stage as a source of motivation to learn more about course content. Some students wrote that they "read current research on the physical and social sciences of climate change" and "dug deeper into the various sub-topics of climate change and personal genomics that what lectures taught". This finding correlates with earlier findings that students felt that the world building stage enhanced their conceptual understanding (Table 1). Along with other written responses, which were mostly positive, the ttRPG assignment seemed to both fulfill the learning objectives and be enjoyable. Students, however, also pointed out two negative aspects: pedagogy and pessimism. While activities like the world building stage encouraged students to learn more, such activities were also seen as time-intensive, disconnected from the course content, and too novel. A few responses noted the time strain, and that "a lot of emphasis was on creating a challenging game structure… this seemed a bigger focus than research or getting science right", or "[they] found the assignments frustrating as [they] had little prior knowledge to go off of". Better contextualization of the course content additionally had a negative effect; better understanding of the problems in climate change and personal genomics influenced pessimistic beliefs. Overall, the written survey responses indicate that the ttRPG assignment was both enjoyable and seemed to have multiple learning benefits, albeit with minor problems.

An important consideration to note is the distribution of survey respondents. Of the 27 respondents, 25 were females. This was a confounding factor in our findings; because the majority of responses were female, our findings may not accurately reflect male sentiments towards the ttRPG. Chou and Tsai's findings highlight the importance of gender differences in gameplay: roleplaying games were played more frequently by males than females (2007). These differences may alter how students experienced the ttRPG. For future studies, gender differences towards gameplay will be taken into further consideration.

Summary

In summary, our study sought to add to the current literature on active learning in examining ttRPGs. Our focus was to examine the use of ttRPGs to enhance learning objectives and course goals. The survey results suggest the ttRPG was successful in enhancing student understanding of course concepts, critical thinking and analytical skills, soft skills, and interdisciplinary knowledge. Students consistently provided high-ranked survey responses during the survey, indicating a strong perception of learning value. However, the greatest overall learning value perceived by students was in the world building and scenario design stages of the ttRPG assignment. Students perceived less value in the actual game play stage of the assignment, specifically when it came to the conceptual understanding of course material and the development of critical thinking and analytical skills. It is notable that when it came to soft skill development and interdisciplinary knowledge, the results for the game-play stage were broadly consistent with the results from the other stages of the assignment. There does not seem to be a significant impact on the perceived learning value of the ttRPG assignment across students in arts or science, although the asymmetric representation of arts students in the course and the survey must be acknowledged. Overall, our findings suggest that our ttRPG assignment has a positive influence on our course learning outcomes. However, we remain cautious, as games are considered engaging and fun; this may exert a positive bias on student responses. Therefore, the actual effects of the ttRPG may be exaggerated (Shellman and Turan, 2006). This a consideration for both current findings and future studies.

Descriptives		
Sum	Mean	Median
25	4	4
26	3.98	4
26	4.06	4
26	4.38	4
25	3.81	4
26	4.09	4
26	4.39	5
25	4.09	4
25	3.14	3
26	3.6	4
26	4.24	4
26	4	4

	Question theme	Average Distribution of student responses				
		1	2	3	4	5
World building stage	CU	0 (0.0%)	2 (8.0%)	2 (8.0%)	14 (56.0%)	7 (28.0%)
	CTA	0 (0.0%)	1 (3.8%)	2 (7.7%)	15 (57.7%)	8 (30.8%)
	SS	0 (0.0%)	1 (3.8%)	4 (15.4%)	14 (53.8%)	7 (26.9%)
	IK	0 (0.0%)	0 (0.0%)	2 (7.7%)	11 (42.3%)	13 (50.0%)
Scenario design stage	CU	0 (0.0%)	3 (12.0%)	3 (12.0%)	14 (56.0%)	5 (20.0%)
	CTA	0 (0.0%)	1 (3.8%)	4 (15.4%)	12 (46.2%)	9 (34.6%)
	SS	0 (0.0%)	0 (0.0%)	4 (15.4%)	8 (30.8%)	14 (53.8%)
	IK	0 (0.0%)	0 (0.0%)	3 (12.0%)	14 (56.0%)	8 (32.0%)
Game play stage	CU	0 (0.0%)	6 (24.0%)	9 (36.0%)	10 (40.0%)	0 (0.0%)
	CTA	0 (0.0%)	5 (19.2%)	6 (23.1%)	9 (34.6%)	6 (23.1%)
	SS	0 (0.0%)	1 (3.8%)	2 (7.7%)	12 (46.2%)	11 (42.3%)
	IK	0 (0.0%)	0 (0.0%)	6 (23.1%)	13 (50.0%)	7 (26.9%)

Table 1. Average distribution of student responses to main question themes per ttRPG stage. Responses were scored on a five point Likert scale, where 1 represents strongly negative and 5 represents strongly positive. Question themes are abbreviated. CU: conceptual understanding of course material; CTA: critical thinking and analytical skills; SS: soft skills; IK: interdisciplinary knowledge. Note that the number of students per question theme do not add up to the total number of respondents, as some students responded twice (these responses were excluded from calculations).

Topic	World building stage distribution									
	1		2		3		4		5	
	Arts	Science	Arts	Science	Arts	Science	Arts	Science	Arts	Science
SS CC	0 (0.0%)	0 (0.0%)	1 (5.9%)	1 (12.5%)	1 (5.9%)	0 (0.0%)	11 (64.7%)	3 (37.5%)	4 (23.5%)	4 (50.0%)
PS CC	1 (5.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (17.6%)	0 (0.0%)	11 (64.7%)	7 (77.8%)	2 (11.8%)	2 (22.2%)
SS PG	0 (0.0%)	0 (0.0%)	1 (5.6%)	0 (0.0%)	3 (16.7%)	0 (0.0%)	10 (55.6%)	4 (44.4%)	4 (22.2%)	5 (55.6%)
PS PG	0 (0.0%)	0 (0.0%)	3 (18.8%)	1 (11.1%)	3 (18.8%)	1 (11.1%)	6 (37.5%)	4 (44.4%)	4 (25.0%)	3 (33.3%)

Topic	Scenario design stage distribution									
	1		2		3		4		5	
	Arts	Science	Arts	Science	Arts	Science	Arts	Science	Arts	Science
SS CC	0 (0.0%)	0 (0.0%)	1 (5.6%)	2 (22.2%)	1 (5.6%)	0 (0.0%)	12 (66.7%)	5 (55.6%)	4 (22.2%)	2 (22.2%)
PS CC	0 (0.0%)	0 (0.0%)	2 (11.1%)	1 (11.1%)	3 (16.7%)	2 (22.2%)	8 (44.4%)	5 (55.6%)	5 (27.8%)	1 (11.1%)
SS PG	0 (0.0%)	0 (0.0%)	2 (11.8%)	1 (11.1%)	2 (11.8%)	0 (0.0%)	10 (58.8%)	5 (55.6%)	3 (17.6%)	3 (33.3%)
PS PG	0 (0.0%)	0 (0.0%)	2 (11.1%)	3 (33.3%)	6 (33.3%)	0 (0.0%)	8 (44.4%)	4 (44.4%)	2 (11.1%)	2 (22.2%)

Topic	Game play stage distribution									
	1		2		3		4		5	
	Arts	Science	Arts	Science	Arts	Science	Arts	Science	Arts	Science
SS CC	0 (0.0%)	0 (0.0%)	3 (17.6%)	3 (33.3%)	5 (29.4%)	3 (33.3%)	8 (47.1%)	3 (33.3%)	1 (5.9%)	0 (0.0%)
PS CC	0 (0.0%)	0 (0.0%)	3 (16.7%)	4 (44.4%)	8 (44.4%)	3 (33.3%)	7 (38.9%)	2 (22.2%)	0 (0.0%)	0 (0.0%)
SS PG	0 (0.0%)	0 (0.0%)	3 (16.7%)	4 (44.4%)	7 (38.9%)	2 (22.2%)	8 (44.4%)	3 (33.3%)	0 (0.0%)	0 (0.0%)
PS PG	0 (0.0%)	0 (0.0%)	3 (16.7%)	4 (44.4%)	9 (50.0%)	2 (22.2%)	6 (33.3%)	3 (33.3%)	0 (0.0%)	0 (0.0%)

	World building stage			
	Mean		Median	
	Arts	Science	Arts	Science
SS CC	4.06	4.25	4	4.5
PS CC	3.76	4.22	4	4
SS PG	3.94	4.56	4	5
PS PG	3.69	4	4	4

	Scenario design stage			
	Mean		Median	
	Arts	Science	Arts	Science
SS CC	4.06	3.78	4	4
PS CC	3.89	3.67	4	4
SS PG	3.82	4.11	4	4
PS PG	3.53	3.56	4	4

	Game play stage			
	Mean		Median	
	Arts	Science	Arts	Science
SS CC	3.41	3	4	3
PS CC	3.22	2.78	3	3
SS PG	3.28	2.89	3	3
PS PG	3.17	2.89	3	3

Table 2. Distribution of Arts and Science responses towards student conceptual understanding during each ttRPG stage, with means and medians. Responses were measured on a five point Likert scale, where 1 is strongly negative and 5 is strongly positive. Each topic is abbreviated. SS CC: social sciences of climate change; PS CC: physical sciences of climate change; SS PG: social sciences of personal genomics; PS PG: physical sciences of personal genomics. Note that the numbers of Arts and Science students per topic vary, as some responded twice (these responses were excluded from calculations).

Topic	World building stage distribution									
	1		2		3		4		5	
	Indiv	Coop	Indiv	Coop	Indiv	Coop	Indiv	Coop	Indiv	Coop
SS CC	0 (0.0%)	0 (0.0%)	1 (8.3%)	0 (0.0%)	1 (8.3%)	0 (0.0%)	6 (50.0%)	6 (66.7%)	4 (33.3%)	3 (33.3%)
PS CC	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (15.4%)	1 (10.0%)	8 (61.5%)	8 (80.0%)	3 (23.1%)	1 (10.0%)
SS PG	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (7.7%)	2 (20.0%)	10 (76.9%)	3 (30.0%)	2 (15.4%)	5 (50.0%)
PS PG	0 (0.0%)	0 (0.0%)	2 (15.4%)	0 (0.0%)	2 (15.4%)	2 (25.0%)	6 (46.2%)	3 (37.5%)	3 (23.1%)	3 (37.5%)

Topic	Scenario design stage distribution									
	1		2		3		4		5	
	Indiv	Coop	Indiv	Coop	Indiv	Coop	Indiv	Coop	Indiv	Coop
SS CC	0 (0.0%)	0 (0.0%)	2 (15.4%)	0 (0.0%)	1 (7.7%)	0 (0.0%)	9 (69.2%)	6 (60.0%)	1 (7.7%)	4 (40.0%)
PS CC	0 (0.0%)	0 (0.0%)	2 (15.4%)	0 (0.0%)	4 (30.8%)	1 (10.0%)	4 (30.8%)	6 (60.0%)	3 (23.1%)	3 (30.0%)
SS PG	0 (0.0%)	0 (0.0%)	2 (15.4%)	0 (0.0%)	1 (7.7%)	1 (10.0%)	9 (69.2%)	5 (50.0%)	1 (7.7%)	4 (40.0%)
PS PG	0 (0.0%)	0 (0.0%)	3 (23.1%)	1 (10.0%)	4 (30.8%)	1 (10.0%)	5 (38.5%)	6 (60.0%)	1 (7.7%)	2 (20.0%)

Topic	Game play stage distribution									
	1		2		3		4		5	
	Indiv	Coop	Indiv	Coop	Indiv	Coop	Indiv	Coop	Indiv	Coop
SS CC	0 (0.0%)	0 (0.0%)	3 (25.0%)	1 (10.0%)	4 (33.3%)	3 (30.0%)	5 (41.7%)	5 (50.0%)	0 (0.0%)	1 (10.0%)
PS CC	0 (0.0%)	0 (0.0%)	3 (23.1%)	2 (20.0%)	8 (61.5%)	2 (20.0%)	2 (15.4%)	6 (60.0%)	0 (0.0%)	0 (0.0%)
SS PG	0 (0.0%)	0 (0.0%)	3 (23.1%)	2 (20.0%)	6 (46.2%)	2 (20.0%)	4 (30.8%)	6 (60.0%)	0 (0.0%)	0 (0.0%)
PS PG	0 (0.0%)	0 (0.0%)	3 (23.1%)	2 (20.0%)	8 (61.5%)	2 (20.0%)	2 (15.4%)	6 (60.0%)	0 (0.0%)	0 (0.0%)

	World building stage			
	Mean		Median	
	Indiv	Coop	Indiv	Coop
SS CC	5.08	4.33	5.5	4
PS CC	4.08	4	4	4
SS PG	4.08	4.3	4	4.5
PS PG	3.77	4.13	4	4

	Scenario design stage			
	Mean		Median	
	Indiv	Coop	Indiv	Coop
SS CC	3.69	4.4	4	4
PS CC	3.62	4.2	4	4
SS PG	3.69	4.36	4	4
PS PG	3.31	3.9	3	4

	Game play stage			
	Mean		Median	
	Indiv	Coop	Indiv	Coop
SS CC	3.17	3.6	3	4
PS CC	2.92	3.4	3	4
SS PG	3.08	3.4	3	4
PS PG	2.92	3.4	3	4

Table 3. Distribution of individual and cooperative learner responses towards student conceptual understanding during each ttRPG stage, with means and medians. Responses were measured on a five point Likert scale, where 1 is strongly negative and 5 is strongly positive. Each topic is abbreviated. SS CC: social sciences of climate change; PS CC: physical sciences of climate change; SS PG: social sciences of personal genomics; PS PG: physical sciences of personal genomics. Note that the numbers of individual and cooperative learners per topic vary, as some responded twice (these responses were excluded from calculations).

Topic	World building stage distribution									
	1		2		3		4		5	
	None	Prior	None	Prior	None	Prior	None	Prior	None	Prior
SS CC	0 (0.0%)	0 (0.0%)	2 (10.5%)	0 (0.0%)	1 (5.3%)	0 (0.0%)	10 (52.6%)	4 (66.7%)	6 (31.6%)	2 (33.3%)
PS CC	1 (5.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	3 (15.0%)	0 (0.0%)	12 (60.0%)	6 (100.0%)	4 (20.0%)	0 (0.0%)
SS PG	0 (0.0%)	0 (0.0%)	1 (5.0%)	0 (0.0%)	3 (15.0%)	0 (0.0%)	10 (50.0%)	4 (57.1%)	6 (30.0%)	3 (42.9%)
PS PG	0 (0.0%)	0 (0.0%)	3 (15.8%)	1 (16.7%)	4 (21.1%)	0 (0.0%)	8 (42.1%)	2 (33.3%)	4 (21.1%)	3 (50.0%)

Topic	Scenario design stage distribution									
	1		2		3		4		5	
	None	Prior	None	Prior	None	Prior	None	Prior	None	Prior
SS CC	0 (0.0%)	0 (0.0%)	2 (10.0%)	1 (14.3%)	1 (5.0%)	0 (0.0%)	13 (65.0%)	4 (57.1%)	4 (20.0%)	2 (28.6%)
PS CC	0 (0.0%)	0 (0.0%)	2 (10.0%)	1 (14.3%)	5 (25.0%)	0 (0.0%)	10 (50.0%)	3 (42.9%)	3 (15.0%)	3 (42.9%)
SS PG	0 (0.0%)	0 (0.0%)	2 (10.0%)	1 (16.7%)	2 (10.0%)	0 (0.0%)	12 (60.0%)	3 (50.0%)	4 (20.0%)	2 (33.3%)
PS PG	0 (0.0%)	0 (0.0%)	4 (20.0%)	1 (14.3%)	5 (25.0%)	1 (14.3%)	9 (45.0%)	3 (42.9%)	2 (10.0%)	2 (28.6%)

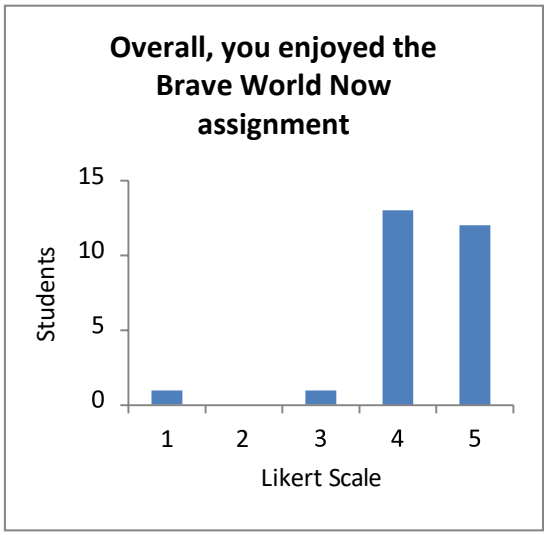
Topic	Game play stage distribution									
	1		2		3		4		5	
	None	Prior	None	Prior	None	Prior	None	Prior	None	Prior
SS CC	0 (0.0%)	0 (0.0%)	5 (25.0%)	1 (16.7%)	7 (35.0%)	1 (16.7%)	7 (35.0%)	4 (66.7%)	1 (5.0%)	0 (0.0%)
PS CC	0 (0.0%)	0 (0.0%)	6 (30.0%)	1 (14.3%)	9 (45.0%)	2 (28.6%)	5 (25.0%)	4 (57.1%)	0 (0.0%)	0 (0.0%)
SS PG	0 (0.0%)	0 (0.0%)	6 (30.0%)	1 (14.3%)	7 (35.0%)	2 (28.6%)	7 (35.0%)	4 (57.1%)	0 (0.0%)	0 (0.0%)
PS PG	0 (0.0%)	0 (0.0%)	6 (30.0%)	1 (14.3%)	9 (45.0%)	2 (28.6%)	5 (25.0%)	4 (57.1%)	0 (0.0%)	0 (0.0%)

	World building stage			
	Mean		Median	
	None	Prior	None	Prior
SS CC	4.06	4.33	4	4
PS CC	3.9	4	4	4
SS PG	4.05	4.43	4	4
PS PG	3.68	4.17	4	4.5

	Scenario design stage			
	Mean		Median	
	None	Prior	None	Prior
SS CC	3.95	4	4	4
PS CC	3.7	4.14	4	4
SS PG	3.9	4	4	4
PS PG	3.45	3.86	4	4

	Game play stage			
	Mean		Median	
	None	Prior	None	Prior
SS CC	3.2	3.5	3	4
PS CC	2.95	3.43	3	4
SS PG	3.05	3.43	3	4
PS PG	2.95	3.43	3	4

Table 4. Distribution of responses towards student conceptual understanding with means and medians, between students with no ttRPG and prior ttRPG experience. Responses were measured on a five point Likert scale, where 1 is strongly negative and 5 is strongly positive. Each topic is abbreviated. SS CC: social sciences of climate change; PS CC: physical sciences of climate change; SS PG: social sciences of personal genomics; PS PG: physical sciences of personal genomics. Note that the numbers of students with and without prior experience vary, as some responded twice (these responses were excluded from calculations).


Overall, you enjoyed the Brave World Now assignment
Students
15
10
5
0
1
2
3
4
5
Likert Scale

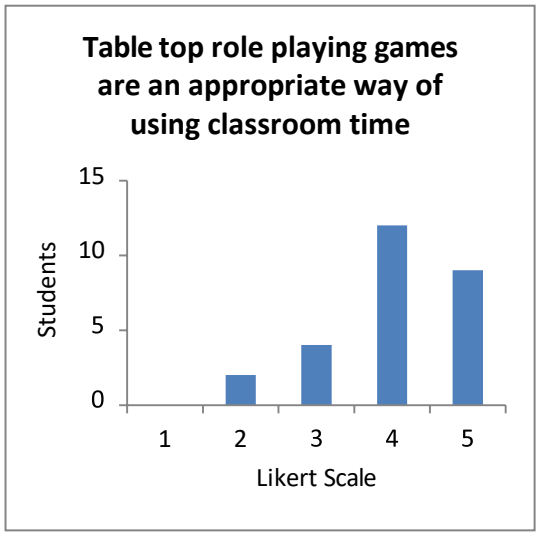
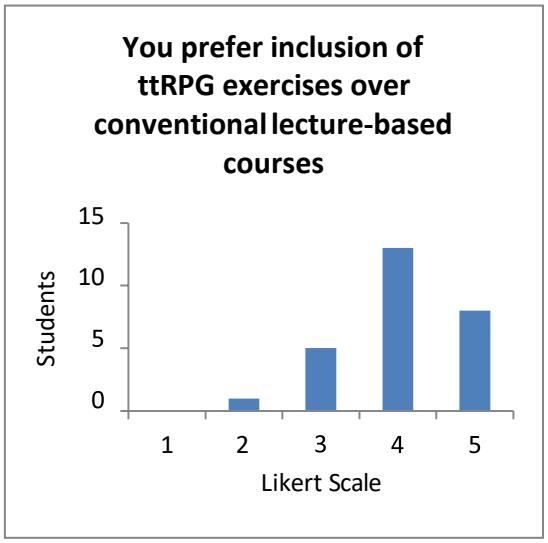
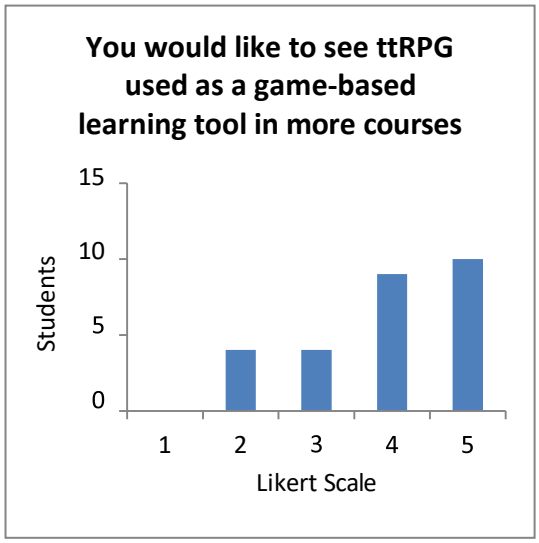
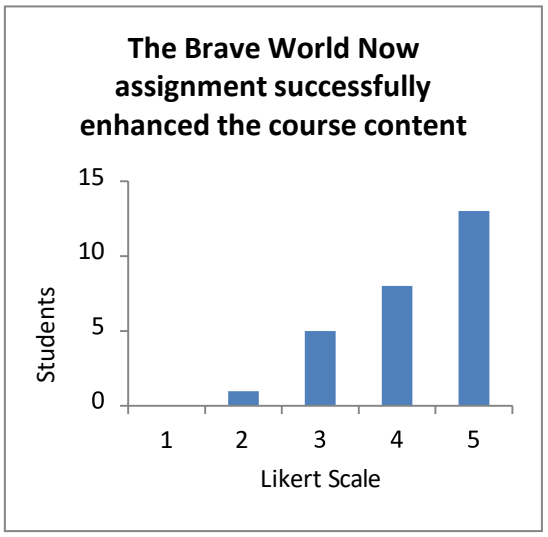
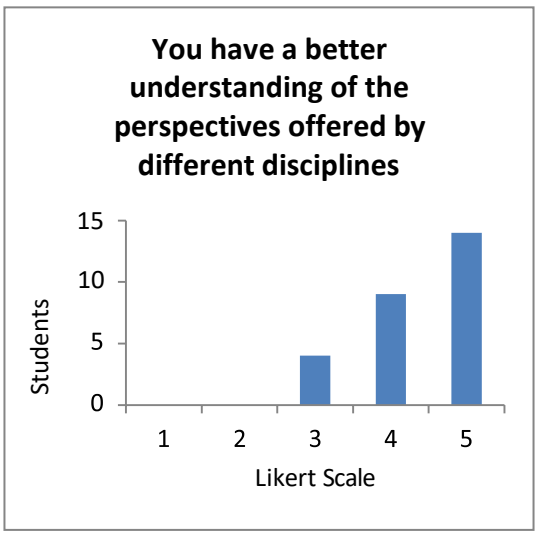


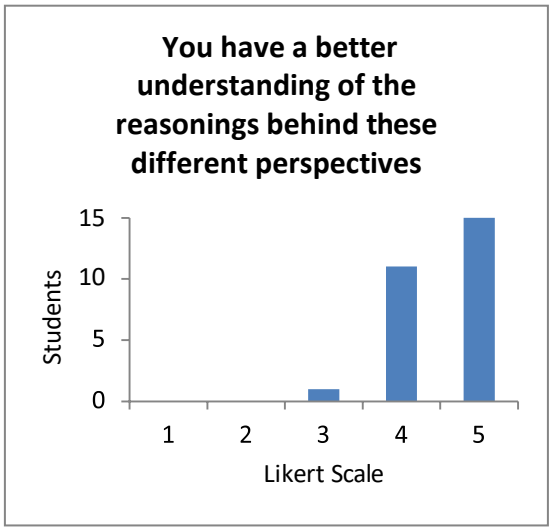
Table top role playing games are an appropriate way of using classroom time
Students
15
10
5
0
1
2
3
4
5
Likert Scale

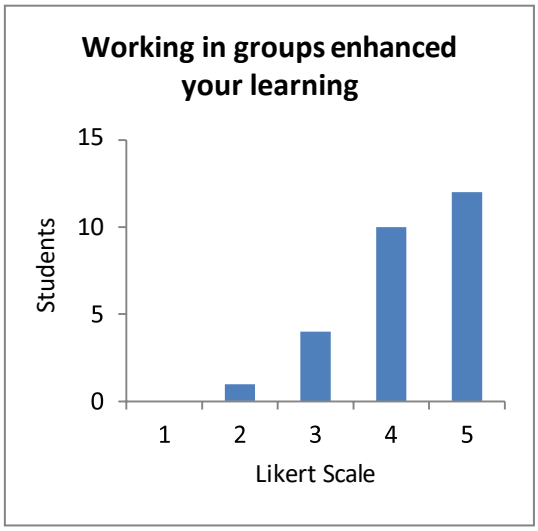

You prefer inclusion of ttRPG exercises over conventional lecture-based courses
Students
15
10
5
0
1
2
3
4
5
Likert Scale


You would like to see ttRPG used as a game-based learning tool in more courses
Students
15
10
5
0
1
2
3
4
5
Likert Scale


The Brave World Now assignment successfully enhanced the course content
Students
15
10
5
0
1
2
3
4
5
Likert Scale


You have a better understanding of the perspectives offered by different disciplines
Students
15
10
5
0
1
2
3
4
5
Likert Scale





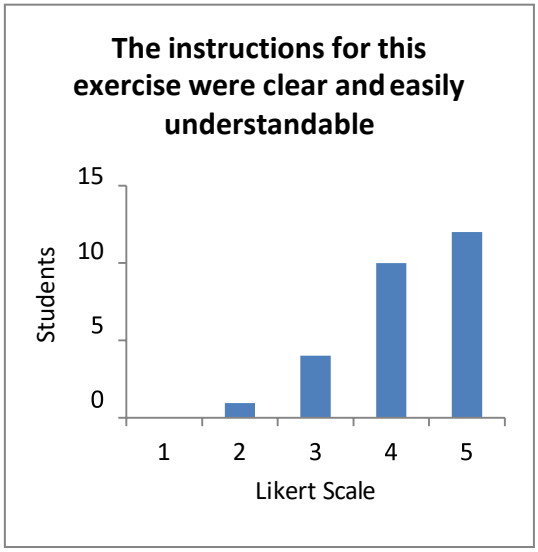


Figure 1. Frequency of student attitudes towards the Brave World Now assignment and its learning applications. Bar graph headings represent exact survey statements (see Supplementary Figure 1 for further details).

Figure 2. Common themes in written student responses.

Pros

- Motivation
  - More interest and/or curiosity
  - Active engagement
  - Inspiration for additional learning
  - Content more relevant and/or increased resonance
  - Novel, innovative, and different from regular assignments
  - Fun and enjoyable
  - Sense of accomplishment with final product
- Optimism
  - Better understanding of problem
- Contextualization
  - Application of course content
  - Realism
- Interaction
  - Solo/Group work
    - Share ideas and expertise
    - Collaboration
    - Compromise
  - Seeing different ideas and perspectives
  - Fun and enjoyable

Cons

- Pedagogy
  - Disconnect from course content
  - Too novel and unfamiliar
  - Time-intensive
  - Focus on creating a good “game”
- Pessimism
  - Better understanding of problem
  - Realism

Supplementary Figure 1. Complete survey questions.

General Information

1. What is your name (this will be kept anonymous)?
2. What is your gender? Male; Female; Other
3. What Faculty do you belong to? Applied Science; Arts; Commerce; Land and Foods Systems; Science; Other
4. What is your major?
5. What is your age?
6. My current grade average is between: 90-100; 85-89; 80-84; 76-79; 72-75; 68-71; 64-67; 60-63; 55-59; 50-54; 0-49
7. What type of learning do you generally prefer? Competitive – learning by competing with other students; Cooperative – learning by working with other students; Individual – learning on your own;

Impressions around Gaming

8. On average, how many hours a week do you play digital (computer, console, or mobile device) games? Less than 1; 1 – 5; 6 – 10; 11 – 15; Over 15
9. On average, how many hours a week do you play other types of games (board games, card games, table top games in general)? Less than 1; 1 – 5; 6 – 10; 11 – 15; Over 15
10. The table below shows general attitudes to playing games. Please rate each attitude with respect to how strongly you agree with it.
    a. Playing games is a sociable activity. Strongly agree; Agree; Neutral; Disagree; Strongly Disagree
    b. Playing games is a waste of time. Strongly agree; Agree; Neutral; Disagree; Strongly Disagree
    c. Playing games helps me to develop useful skills. Strongly agree; Agree; Neutral; Disagree; Strongly Disagree

d. Playing games is time consuming. Strongly agree; Agree; Neutral; Disagree; Strongly Disagree

e. Playing games is interesting. Strongly agree; Agree; Neutral; Disagree; Strongly Disagree

f. Playing games is a worthwhile activity. Strongly agree; Agree; Neutral; Disagree; Strongly Disagree

g. Playing games is enjoyable. Strongly agree; Agree; Neutral; Disagree; Strongly Disagree

h. Playing games is a valuable activity. Strongly agree; Agree; Neutral; Disagree; Strongly Disagree

i. Playing games is exciting. Strongly agree; Agree; Neutral; Disagree; Strongly Disagree

11. What was your prior experience with table top role playing games? I have played before, but only once or twice; ASIC 200 was the first time for me; I have played before, but not very often;

Section I: World Building

12. The world building stage of the Brave World Now Project was successful in achieving the following learning objectives.

    a. Better understanding of the social sciences of climate change. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

    b. Better understanding of the physical sciences of climate change. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

    c. Better understanding of the social sciences of personal genomics. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

    d. Better understanding of the physical sciences of personal genomics. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

    e. Examining literature and research that is not in your discipline or major. Strongly agree;

Agree; Neutral; Disagree; Strongly disagree

f. Improving communication skills. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

g. Improving ability to collaborate towards a common objective.Strongly agree; Agree; Neutral; Disagree; Strongly disagree

h. Critical problem solving. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

i. Acknowledging your role as a potential agent of change in the world. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

j. Analyzing alternative outlooks on the future of the world. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

k. Understanding other world views and perspectives. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

l. Recognition that the world is complex and transdisciplinary. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

13. Did the world building components of this assignment motivate you to learn more about the course content?

14. What were your reasons for building the world that you did?

Section II: Scenario Design

15. The scenario design stage of the Brave World Now Project was successful in achieving the following learning objectives.

    a. Better understanding of the social sciences of climate change. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

    b. Better understanding of the physical sciences of climate change. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

    c. Better understanding of the social sciences of personal genomics. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

d. Better understanding of the physical sciences of personal genomics. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

e. Examining literature and research that is not in your discipline or major. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

f. Improving communication skills. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

g. Improving ability to collaborate towards a common objective.Strongly agree; Agree; Neutral; Disagree; Strongly disagree

h. Critical problem solving. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

i. Acknowledging your role as a potential agent of change in the world. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

j. Analyzing alternative outlooks on the future of the world. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

k. Understanding other world views and perspectives. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

l. Recognition that the world is complex and transdisciplinary. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

16. Did the scenario design components of this assignment enhance your understanding of the future world you built or generally motivate you to learn more about the course content?

17. How were you able to apply content or concepts from previous courses when creating your scenario?

18. What motivated your team to pick your specific narrative and scenario?

Section III: Game Play

19. The game play stage of the Brave World Now Project was successful in achieving the following learning objectives.

a. Better understanding of the social sciences of climate change. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

b. Better understanding of the physical sciences of climate change. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

c. Better understanding of the social sciences of personal genomics. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

d. Better understanding of the physical sciences of personal genomics. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

e. Examining literature and research that is not in your discipline or major. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

f. Improving communication skills. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

g. Improving ability to collaborate towards a common objective. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

h. Critical problem solving. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

i. Acknowledging your role as a potential agent of change in the world. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

j. Analyzing alternative outlooks on the future of the world. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

k. Understanding other world views and perspectives. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

l. Recognition that the world is complex and transdisciplinary. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

20. When you played the game, were you a game master or a player? Game master; Player

21. If you were a player, please fill out whether you agree or disagree with the game play specific statements below. If you were a game master, you can skip this section.

22. The game requires us to work as a team. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

23. The quality of the game was determined by the ability of the game master. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

24. Being in someone else's world challenged me to rethink my own. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

25. I enjoyed playing the game. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

26. If you were a game master, please fill out whether you agree or disagree with the game play specific statements below. If you were a player, you can skip this section.

    a. The game required players to work as a team. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

27. The quality of the game was determined by the role playing ability of the players. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

28. Watching players act in your designed world challenged me to rethink my world. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

29. I enjoyed being a game master. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

30. Do you think there was any value to playing the game?

31. Considering the Brave World Now table top role playing game (ttRPG) project as a whole, do you agree or disagree with the statements below?

    a. Overall, you enjoyed the Brave World Now assignment. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

    b. Table top role playing games are an appropriate way of using classroom time. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

    c. You prefer inclusion of ttRPG exercises over conventional lecture-based courses. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

d. You would like to see ttRPG used as a game-based learning tool in more course.
   Strongly agree; Agree; Neutral; Disagree; Strongly disagree

e. The Brave World Now assignment successfully enhanced the course content.
   Strongly agree; Agree; Neutral; Disagree; Strongly disagree

f. You have better understanding of the perspectives offered by different disciplines.
   Strongly agree; Agree; Neutral; Disagree; Strongly disagree

g. You have a better understanding of the reasonings behind these different perspectives.
   Strongly agree; Agree; Neutral; Disagree; Strongly disagree

h. Working in groups enhanced your learning. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

i. The instructions for this exercise were clear and easily understandable. Strongly agree; Agree; Neutral; Disagree; Strongly disagree

32. Did the assignment inspire positive or negative views of the future? Why do think this is the case?

33. How can we improve this exercise for future students?

34. Please use the space below to provide any additional feedback for this assignment.

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