The aim of the *International Journal of Role-Playing* is to act as a hybrid knowledge network, bringing together the varied interests in role-playing from its associated knowledge networks, e.g. academic research, games, creative industries, the arts, and role-playing communities.

Editorial
Special Issue: Role-playing and Simulation in Education Conference 2018

Welcome to Issue 8 of the *International Journal of Role-Playing*. In the past few years, the educational role-playing game (RPG) has evolved from its roots as a curious hybrid of leisure role-playing and experiential learning to an increasingly widespread practice around the world. This year saw the publication of the first textbook in our field, *Role-Playing Game Studies: Transmedia Foundations* (2018), edited by José P. Zagal and Sebastian Deterding, a collaboration between dozens of scholars and practitioners from several countries. The book features significant contributions on topics pertaining to virtual, tabletop, and live action role-playing (larp) from a multitude of disciplines and approaches, including a chapter on the use of role-playing in education. This special issue of the *International Journal of Role-Playing* further demonstrates this expansion in our field, featuring peer-reviewed articles from Singapore, the United States, Brazil, and Canada. This edition highlights papers selected from a excellent group of presentations at this year's Role-playing and Simulation in Education Conference, which took place on May 17, 2018 at Northeastern University in Boston, MA.

As with its previous iteration, the event was held in concert with the Living Games Conference 2018, which is devoted to the academic and practical study of larp in all its forms. This year, Evan Torner and I collaborated with Celia Pearce from the Game Design Program of Northeastern University's Department of Art+Design. The conference featured a wide range of topics, including two exemplary keynoters: Elizabeth Fein from Duquesne University, who discussed larp interventions for children with autism at a summer camp, and Northeastern's Kellian Adams Pletcher, who explored the use of role-playing and games in museums. Role-playing and Simulation in Education aims to include many forms of experiential learning under a broad umbrella with the goal of exchanging expertise and inspiration among practitioners, scholars, and players alike.

The articles featured in this issue are no exception, representing a fascinating array of applications of educational role-playing in various contexts. Ken Koziej and Mikael Hellström's "Year Zero Economics: Using Edu-Larping to Explore Economic Systems in the Ninth Grade" discusses their experimental design of an economics unit for high school students in Alberta, Canada. Adapting the setting of the popular video game *Mutant: Year Zero*, the authors applied principles from gamification, game-based learning, and edu-larp to help students better understand the social, political, and economic constraints caused by scarcity. The authors evaluate their educational design according to scholar Michał Mochocki's (2014) suggested criteria for effective edu-larps. This application demonstrates how theories and practices in the field of role-playing studies are becoming influential in wider circles.

Magdalene Loh presents another interesting application geared toward a wider range of ages. In "Edu-Larping for Career Design," she discusses the Career Design Life Game that she helped develop in Singapore, which was tested by 216 participants aged 12-65. The game is designed to mimic the types of challenges individuals must face when pursuing a career in today's volatile job market. The game establishes a character sheet-like Identity Document that highlights the character's skills based upon Howard Gardner's (1983) theory of multiple intelligences and Paul Tough's (2012) synthesis of Performance Character. The game allows participants to pursue various career strategies and obtain feedback from game masters regarding the relative success of these approaches. This work received positive qualitative reviews from participants of all ages, indicating a refreshing direction for individuals wishing to expand upon their career development skills.

Next, the issue features a fascinating exploration of the philosophy behind creativity and how card-based storytelling games might inspire new channels of expression. In "Wonder Cards Storytelling: Imagination, Storytelling, and Role-playing in the Creation of Objects, Spaces, and Experiences," Rian Rezende, Sabrina Araujo, and Denise Portinari discuss the development of their game system. The Wonder Cards prompt players to develop stories based upon a sequence of randomly chosen cards. This design is augmented by the Storytelling expansion, which inspires groups to create role-playing scenarios based upon the constraints offered by the cards. The authors found that students in their design classes at Pontifical Catholic University in Rio de Janeiro, Brazil, were able to take new creative leaps by using the randomness of the cards to inspire new avenues for story-

telling.

Our final article also discusses the use of role-playing in the college classroom, this time applying the method to scientific subject matter. In "Case Studies as Tabletop RPGs," Susan Weiner uses her considerable experience as a role-playing game designer to create tabletop scenarios for students to solve case studies. She discusses examples from her undergraduate and graduate-level medical physiology course, in which students practice diagnosing and treating diseases. Weiner discusses the ways in which role-playing improved student engagement by providing increased opportunities for agency within the fictional scenarios. Her work nicely complements previous publications on the use of educational role-playing games to help augment simulations for training in the medical field (cf. Standiford 2014; Bowman and Standiford 2016), further helping to contextualize the role of RPGs within the overall scope of experiential learning for professional training.

These articles represent a few examples of the ways in which educational role-playing, gaming, immersive environments, and simulation are evolving around the world. The *International Journal of Role-Playing* is honored to further this important discourse on experiential learning in our increasingly interactive, participatory times.

-- Sarah Lynne Bowman, Ph.D.
Coordinating Editor
December 27, 2018

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Year Zero Economics: Using Edu-Larping to Explore Economic Systems in the Ninth Grade

Abstract: The curriculum of the province of Alberta, Canada, stipulates that grade nine students learn about economics, comparing the United States and Canada (Alberta Education 2007). Supervisor Ken Koziej assigned Mikael Hellström to teach this unit to three grade nine classes during his practicum. Hellström had pioneered the use of edu-larps, game-based learning, and gamification as a sessional instructor at the Universities of Alberta and Calgary (Hellström 2016; 2017) and chose those methods to deliver the unit. The game design for the tabletop role-playing game *Mutant: Year Zero* (The Free League 2015) incorporates mechanics for play on three levels: character, for world exploration; resource extraction and world exploration; and base building. The latter two levels effectively create an in-game economy. Collaborating with his supervisor, Hellström adapted them for classroom use. The goal was to create a unit fulfilling Mochocki's (2014) criteria for edu-larp, in other words, that it is a) mono-disciplinary and targets a single school subject; b) knowledge-oriented and communicates textbook subject matter to students; and c) teacher-friendly, by not demanding time-consuming preparations. This paper describes the unit, the process of converting elements of *Mutant: Year Zero* for teaching, how students played the unit, and the post-game evaluation. While the unit did not fulfill all of Mochocki's criteria, student engagement was high, consistent with previous findings on game-based learning (Prensky 2005; Gee 2007; Hattie 2009).

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1. INTRODUCTION

The curriculum of Alberta, Canada, includes a unit of economics for grade nine students (Alberta Education 2007). Supervisor Ken Koziej assigned Mikael Hellström to teach three grade nine classes this unit during his practicum. Hellström had pioneered the use of edu-larps, game-based learning, and gamification as a sessional instructor at Universities of Alberta and Calgary (Hellström 2016; 2017) and chose those methods to deliver the unit.

The tabletop role-playing game *Mutant: Year Zero* (The Free League 2015) includes mechanics for world exploration and resource extraction, as well as for base building. Thus, the game integrates an economy, making it suitable for classroom use. Hellström's goal was to create a unit fulfilling Mochocki's criteria for edu-larp; in other words, that it is a) mono-disciplinary and targets a single school subject; b) knowledge-oriented and communicates textbook subject matter to students; and c) teacher-friendly, by not demanding time-consuming preparations (2014). This paper describes the unit, the process of converting elements of *Mutant: Year Zero* for teaching, how students played the unit, and the post-game evaluation. Interestingly, although the unit did not fulfill all of Mochocki's criteria, student engagement was very high throughout the unit, consistent with previous findings on game-based learning (Prensky 2005; Gee 2007; Hattie 2009).

2. THE UNIT

The curriculum of Alberta, Canada, includes a unit of economics for grade nine students (Alberta Education 2007). Supervisor Ken Koziej assigned Mikael Hellström to teach three grade nine classes this unit during his practicum. Hellström had pioneered the use of edu-larps, game-based learning, and gamification as a sessional instructor at Universities of Alberta and Calgary (Hellström 2016; 2017) and chose those methods to deliver the unit.

3. ADAPTING *MUTANT: YEAR ZERO* FOR CLASSROOM USE

Game-based learning and gamification is highly effective for creating student engagement and motivation (Prensky 2005; Gee 2007; Hattie 2009). Drawing on previous experiences with edu-larp and other forms of game-based learning, Hellström determined that positioning basic economics concepts in a fictional world where students had to experiment with building their own economies would make the concepts clearer. Such a method would facilitate a bird's eye view of how concepts apply to the Canadian and American systems.

In the role-playing game *Mutant: Year Zero*, players take the roles of members of a small colony of post-apocalyptic survivors. The colonists have to find food in the ruins of the old world or starve. The IInIn

tabletop role-playing experience: players play the mutants of the colony and have to survive in a hostile world. The second level is communal: the players act as the collective, deciding what projects the colony should undertake to make it more productive. The third dimension concerns exploration of the environment surrounding the colony, using a map with a grid. Players explore the map's grid to find the scarce resources they need for colony development. Finding technological artifacts from the pre-apocalypse world, like advanced weapons, vehicles, or books, is particularly helpful. The latter two dimensions of game-play thus integrate an in-character economy into the design, making *Mutant: Year Zero* particularly well suited for an edu-larp unit on basic economics.

Some adaption was necessary. For example, Hellström removed the mutants from the setting, so that the mutant powers would not distract from the study of economics. He also simplified the character sheet considerably for easier run-time game mastering of 80 student players (see Figure 1).

**Figure 1:** The Year Zero Economics character sheet.

Attributes			
Health			
Social			
Skills			
Fight			
Research			
Exploring			
Caring			
Arts			
Labor			
Weapons, Artifacts, and Gear			
Grub	Dirty	Clean	Delish
Supplies			
Scrap			
Bullets			

Losing all health points meant that the character could not take any actions. Characters who did not consume a point of grub at the end of a class lost one Health point. Social points added to the health points for the unit's final score. The class with the highest Social + Health score would win the game. Players could use the skills for actions, e.g. exploring a map grid for more resources, building innovations for the colony, or healing other characters. A character with a high labor skill could build things faster than a character with a low labor skill.

Supplies, scrap, and bullets represented resources needed to improve the colony. For instance, characters used supplies to build anything from protective walls to sophisticated sanitation systems for cleaning dirty grub. Students designed these innovations as part of their assignments, applying their learning of economic principles as they described the economic impact these innovations had within the diegesis.

The class made up the diegetic colony in post-apocalyptic Edmonton. Hellström decided that the colony would have no system of government at the start, compelling students to decide what system of government the colony would have. The unit used a map of post-apocalyptic Edmonton for the exploration part of the game, designed by Haglund Hellström. Mikael Hellström projected it on the smartboard using the Roll20 app (The Orr Group). He decided that the three class colonies would share a diegesis. Consequently, characters from the different colonies might meet each other during play. The primary motivation for exploration, however, was to locate resources to improve the colony. For this process, Hellström used the artifact cards for *Mutant: Year Zero*, adapting the card game mechanics to suit the class game.

Figure 2: The Year Zero Economics map of post-apocalyptic Edmonton, Alberta. Two of the classes chose to place their colonies, called Arks, next to each other, close to what today is the downtown core to gain access to water. The green check marks represent areas that student characters explored for resources. This class had not yet discovered the third class colony. Map design by Anna Eleonora Haglund Hellström.
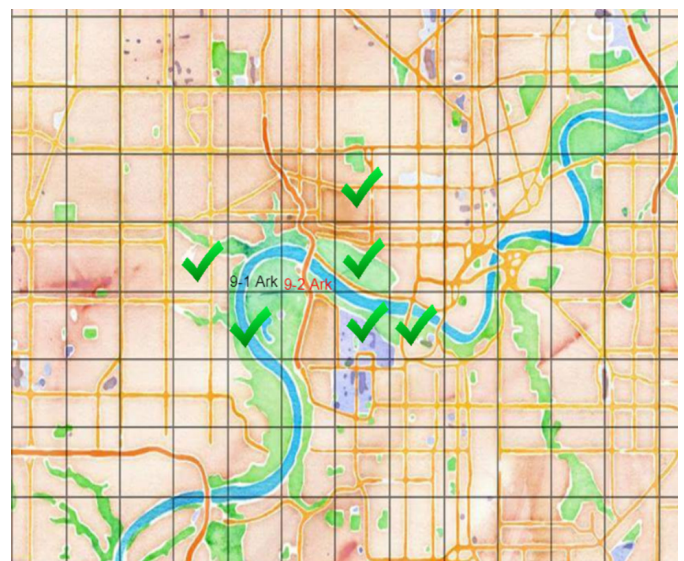
Finally, Hellström created assignments from the class reader and the exam questions Mr. Koziej used for past runs of the unit. He turned them into quests for students to pursue on the website Rezzly (Rezzly Education Technologies, LLC) during class time and as homework. Completing the quest assignments provided students with experience points, which leveled up their character skills. Thus, completing assignments about key economic concepts had in-game effects. That way, Hellstrom leveraged the game engagement as a positive incentive for students to learn about economics (Haskell 2013).

4. RUNNING THE GAME

When the unit began, Hellström presented the three grade nines with the scenario. The class constituted a colony of survivors emerging from their safe haven to explore the irradiated wasteland of post-apocalyptic Edmonton, Alberta. They would have to build their colony to avoid starving, deciding on how to govern their economy and manage resource scarcity. The three grade nines were playing this simulation in parallel on the same game map, accessed through Roll20, and so the three classes could discover each other's bases. When that occurred, they had to decide whether to co-exist peacefully or enter into conflict with each other.

The first sign that the game design had potential was when the students chose a location for their colonies on the map. All students chose to place their colonies in strategic locations with some form of connection to water. This decision, driven by a resource extraction analysis based on trying to minimize scarcity, is economic thinking on display, even though the students were unaware of that at the time. Even so, the Rezzly webtool confused students initially, and they had to learn how to navigate it, which always takes some time for first-time users. Once that was completed and they understood the game, it flowed smoothly.

A typical class proceeded as follows: Hellström presented a summary of student questions on course material submitted from the last class, and clarified key economics concepts as needed. Then, the simulation game started, continuing from where it left off last class, with Hellström introducing any new narrative twists or turns. Students then decided what actions their characters would take and those actions were resolved. The class ended with a 10 minute debrief session where Hellström connected their actions and used them to illustrate how students acted according to key concepts in economics. For example, students might be encouraged to forecast

how the cost of grub would develop over the next week. Hellström would then show the students how they used supply and demand mechanisms to do that forecast, and how that exercise mimicked the operation of contemporary stock markets.

Engagement was clearly on display in several ways. Students:

- Talked passionately about the game and economics during and between classes. Many of the students started negotiating across classes to plan their game actions.

- Designed innovative and well-motivated solutions for improving the colony, including sanitation systems, defenses, agricultural production, and art galleries.

- Specialized in skills when they noticed the resulting increase in cost-efficiency.

- Decided what government system the diegetic colony would use. One class chose to implement an oligarchic dictatorship and another class chose direct democracy. The play demonstrated the shortcomings of those governmental systems as students had to devote time to manage governance instead of producing the goods and services needed to improve the material standard of living.

This heightened engagement is consistent with research findings on the effects of using other types of games and gamification for learning (Prensky 2005; Deterding, et al. 2011; Sheldon 2012; Fui-Hoon Nah, et al. 2013; Haskell 2013).

5. POST-GAME CLASS DESIGN EVALUATION

When instructors use traditional, passive, teaching methods, students struggle to understand issues of macro-level economics: how society copes with scarcity and how government affects the economy and the distribution of goods in society. For example, governments may ask members of society to sacrifice their resources for the good of others. In the game play, students gained that deeper understanding of the effects of scarcity and the consequences of government decisions on the distribution of resources in society. Students were sometimes required to give up resources or complete tasks that they did not want to do to ensure they had the resources for survival. These moments in the game were often very emotional as students came to understand the difficult choices many societies must make when facing resource allocation issues. Students engaged in active debate over the possible positives, the

negatives, and the impact (long and short term) their decisions would have on their group. Some of the decisions led to positive outcomes, while other decisions put the group in very tough situations. This too deepened their understanding as they learned how a poor decision that gave short-term gain led to a larger long-term negative consequence for their society.

Students also developed deeper understanding of economic decision making at a micro level. That understanding came across in how they made decisions on what activities to undertake every turn. Thus, trading with each other, exploring, or designing an innovation for the colony all affected how many resources they had, could use, or could gain. Students often opted for skill specialization, much as people choose to develop their expertise in a particular occupation.

6. TESTING THE UNIT AGAINST MOCHOCKI'S CRITERIA

The first of Mochocki's criteria for an edu-larp is that the unit is mono-disciplinary and targets a single school subject. This unit fulfilled those criteria. It targeted the central concepts of economics consistently. Even when classes discussed colony governance, the continual focus was the consequences for economics. Mochocki's second criterion is that the edu-larp has to be knowledge-oriented, communicating textbook subject matter to students. In exam results of both multiple choice and short essay writing pieces, students were able to demonstrate a stronger and deeper understanding of the concept of scarcity than did previous student cohorts. They understood that sometimes societies must make very difficult decisions to ensure the vast majority of people have access to essential resources. Many found it difficult to answer the question, "How can some many have so much, as so many have so little?' After the game, over several weeks, Koziej's class discussions and debates centered on the topic of access to resources. The game generated some deep student thought and true engagement around issues of economic fairness, equality (gender, geographic, and political), and the effective use of resources to meet needs and wants. These findings and experiences are consistent with previous research showing that increased engagement tends to result in deeper learning (Sorcinelli 1991; Bates and Poole 2003; Twigg 2003; Hattie 2009). The unit thus did fulfill Mochoki's second criterion.

However, Mochocki's third criterion for a good edu-larp is that the larp is teacher-friendly and does not demand time-consuming preparations. The time

Hellström needed to design the unit was available to him as a student of education. It is not clear whether he would have been able to design the unit as a practicing teacher. Nor is it clear whether other teachers would be able to pick up the material and use it to teach their students. Thus, it may not fulfill Mochoki's third criterion. The edu-larp needs to be modified so that it becomes easily accessible for teachers who want to use a tool like this to teach economics.

The study is limited by the nature of the post hoc evaluation. This was not a planned study with a control group. Rather, it emerged as Mr. Koziej identified the value added of using the class design during the practicum and the need to capture the results. As such, an opportunity to run the unit once more with a control group would be welcome. The next step for Koziej, Haglund Hellström, and Mikael Hellström is to adapt the unit so that it becomes easily transferable and accessible for other teachers. For future research, Hellström is exploring the possibility to use edu-larps in immigrant settlements.

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Edu-Larping for Career Design

Abstract: Career Design can be effectively taught through experiential learning and gamification. This paper explains the basis and structure of the Career Design Life Game, and examines the research undergirding the game. Created for the purpose of helping participants better understand the job market in today's volatile, uncertain, complex, and ambiguous (VUCA) world, the game mimics the actual world of school and jobs. Career advancement methods differ in each job family and are designed by industry practitioners. Character statistics are based on Howard Gardner's theory of Multiple Intelligences and Paul Tough's synthesis of Performance Character. They are also drawn from a broader body of research on growth mindset and grit. Real-world learning points, like the importance of continuous learning, are built in for participants to pick up through experiential gameplay. At the end of the game, participants are invited to consider "Wit, Grit and Fit": how their interests and skills may be gainfully employed for meaningful careers; what sacrifices they are prepared to make for that goal; and what sorts of jobs are the best fit for them. They are given tools to continue exploring their wit, grit and fit in the real world.

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1. INTRODUCTION

Career Design is an important and well-researched area that can be effectively taught through experiential learning and gamification. The Career Design Life Game was created for this purpose. The game was tested on 216 people in Singapore aged 12 to 65 years old, earning positive qualitative reviews. Significantly, the game sparked conversations, especially among people who are usually the target of career services: students and more mature workers.

With the 4th Industrial Revolution and rapid displacement of jobs, governments and businesses around the world are increasingly invested in getting more of their citizens and staff to take the initiative in re-designing traditional career paths and to continuously upgrade their skill-sets.

Much recent research has explored what it takes to achieve a meaningful, upwardly mobile career. Sheryl Sandberg (2013) popularized the "jungle gym" concept, arguing that skill-sets and the right mindset were more relevant to career advancement than the old concept of climbing a ladder. C. Branton Shearer (2009), building on the seminal work of Howard Gardner (1983; Bordie 2015), links the suitability of jobs to a person's multiple intelligence profile. Angela Duckworth (2006) and Carol Dweck (2007) posit that grit and a growth mindset are amongst the most reliable predictors of life success. Paul Tough (2012) adds to these by identifying other traits like conscientiousness, curiosity, optimism, self-control and zest, under the umbrella of Performance Character. Tough indicates these traits as critical success factors for a more fruitful life. Richard Bolles

(2017) provides very practical tools and tips on how to find the right role and maximize job satisfaction.

The problem is that the lay person reads only a fraction of these greatly useful works, if at all. In fact, the segments of the population who need these messages the most -- the relatively under-educated, the less vocationally mobile, and less academically inclined students -- are probably those that have the least access or inclination to read them.

In searching for a medium that competently transmits these key concepts, educational live action role-play ("edu-larp") stands out as a promising solution because of its inherent ability to flesh out a parallel world, actively engage students (Bowman 2014; Bowman and Standiford 2015) and enable experiential learning so that each participant takes away what they need most at that point in time (Hyltoft 2008; Howes and Cruz 2013).

2. GAME STRUCTURE AND MECHANICS

2.1 Character Creation and Game Mechanics

The Career Design Life Game starts by introducing participants to the fictional city where the game is set. This city is designed to have significant similarities to the actual educational and job world of the participants to make the game realistic and relevant. However, the game does not exactly mirror the city for 2 reasons: (a) game-play logistical and timing constraints; and (b) to help participants look for principles instead of blindly relying on their real-world knowledge.

A participant's first act is to decide on character statistics. Choosing from Gardner's 8 Multiple Intelligence types, participants decide how they would like to allocate their 48 points (out of a total of 80 points) to each. They may choose to play a character close to their perception of themselves, or experiment with a different persona.

In the spirit of reaching the casual gamer/average person, the game eschews terminology in favor of simple layperson's language. For example, instead of "linguistic intelligence," the game uses the easier to understand "word smart." Other smarts include: logic (logical-mathematical), self (intra-personal), people (inter-personal), music (musical), body (bodily kinesthetic), picture (spatial), and nature (naturalist).

The character's Identity Document includes a section on Performance Character, which will be populated by game masters as the game progresses (see Figure 1). This document highlights the instances participants display these characteristics and encourage these behaviors.

Participants are also introduced to their academic progress tracker, which determines the jobs for which they qualify and their bank account. They are given a brief orientation of the working world and told that there is a career center if they should wish to learn more.

Figure 1: The SingaLand Identity Document.

Immediately after this, participants are ushered into game mode, where they are told that they are 12-year-olds taking a national placement examination at the school. This scenario is constructed to mirror the educational experience in Singapore. If played in a different context, modifications should be made to ensure realism.

This national examination is the only compulsory thing the participants have to do in the entire game. Apart from this exam, participants may explore the game world on their own, making their own decisions as to whether to continue their education, to go on to the working world, and which jobs to take.

A key principle of this game is that there is no front-loading; participants are invited to immerse themselves in the game world and will have to discover it on their own. Learning to navigate an unknown and uncertain career world is an important component of the game, as well as an important real-world take-away for participants.

The game is broken up into 4 to 6 half-hour slots, with a 5 minute out-of-game pause at the end of each slot for a quick check-in of where the participants are in the game and how they are feeling about it. As a game mechanic, this pause serves to direct participants to areas they collectively have not yet discovered and is useful for game masters to deal with in-game issues in a timely manner.

2.2 Exploring the Game World

The job world itself is made up of four to eight different career tracks, depending on the size of the group and its objectives. They include: (a) Arts and Entertainment; (b) Business and Entrepreneurship; (c) Food and Beverage; (d) Purchasing and Retail; (e) Sales and Marketing; (f) Social Media; (g) Software Development; and (h) the Gig Economy. These tracks each have 3 levels through which participants can progress and also specific entry and advancement requirements.

At some stage, participants will find that they cannot progress further without leveling up with Continuing Education. These are courses outside of the academic track, and for the purpose of this game, would add to the participant's Multiple Intelligence score. This process broadly mirrors soft skills development in the real world. Using the Software track example, Senior Developers with People scores of less than 8 will not be able to progress to a managerial role unless they do not take the effort to increase that score. In the game, this improvement can be done by going back to the School for bite-sized classes.

Table 1. Career Requirements for the Software Development track.

Junior Developer	Have at least Ó' levels academic qualification + Logic score of at least 6
Senior Developer	Be a Junior Developer for 3 rounds <u>or</u> have solved an advanced puzzle
IT Manager	Be a Senior Developer and have a People score of at least 8; or have <u>an</u> People score of 10 and be at level 2 of any other career track

In addition, like in the real world, some participants may be motivated mid-game to take additional academic courses to explore alternative career tracks or for self-actualization.

Game masters have dual roles as the controllers of game mechanics and as facilitators of learning. They are the non-player characters (NPCs) who play the roles of employers, customers, bankers, teachers, and more. These NPC roles are highly scripted to reflect actual competencies and scenarios faced by the different job types. For the sales jobs, for example, a veteran sales manager with a large team was tapped to describe what his best salespeople are like and what sort of training he would give them. These responses are then gamified and scripted for consistency.

At the same time, one of the game masters' key functions is also to spot participants exhibiting Performance Character traits. When such a trait is observed, the game master will, without comment, mark the relevant trait on the participant's Identity Document with 1-3 points. In the debrief at the end of the game, these points will be tallied and top scorers acknowledged to put the spotlight on Performance Character. In all the games played to date, some of the participants who display these positive character traits were among the richest or at the apex of their chosen professions, which acts as a further reinforcement of the importance of Performance Character.

3. THE UNDERLYING RESEARCH

Apart from the research already cited in the introduction, Howard Gardner's "Beyond Wit and Grit: Rethinking the Keys to Success" also served as an important conceptual anchor for this game (TEDx Talks 2015). In Gardner's The Good Project (2018), he outlines how he pioneered the field of Multiple Intelligence (wit), touches upon the increasingly popular topic of grit, and then concludes that there is more to success than these traits.

The Good Project website provides some guidance on the gaps that Gardner identified. Some of these revolve around:

− *values* (deck of 30 Value Sort Cards)

− *purpose* (toolkit with questions like "What is the primary goal of your work?"; "Is there an overarching goal that gives meaning to what you do?")

− *practicality* (toolkit with questions like "How will you know when you have 'made it'?" and sample narratives, which are essentially case studies on career decisions).

These factors are broadly similar to Richard Bolles' (2017) 7 "petals" framework, which is comprised of fields of interests, skills, preferred working conditions -- including practical considerations like preferred level of responsibility, salary and work locale -- and coherence with purpose in life. They are also complementary with Edgar Schein's (2013) 8 identified Career Anchors of (a) technical/ functional competence; (b) general managerial competence; (c) autonomy/ independence; (d) security/ stability; (e) entrepreneurial creativity; (f) service/ dedication to a cause; (g) pure challenge; and (h) lifestyle.

I have chosen to term these factors as "fit," i.e. how well a particular job fits that job seeker.

Pulling together all of the above research concepts and synthesizing them, we distilled the key messages to:

− **Wit**: Interests, Skill-sets - "What do I like best and can I do best?"

− **Grit**: The 10,000 hours - "Will I stick it out long enough to win? Do I have the right mindset and soft skills to succeed?"

− **Fit**: Values, Personality, Work Environment - "Where can I shine best?"

The learning benefits of edu-larp, particularly for social studies type content, include increased self-awareness and increased intrinsic motivation. These benefits are well documented, and handily summarized by Bowman's (2014) secondary literature review.

From a gaming perspective, and using Richard Bartle's (2003) taxonomy, it is also worth mentioning

that participants of this game can engage as Achievers (to reach the top of their chosen career fields or maximize for wealth), Explorers (to try as many jobs or variations of the game), and Socializers (to interact with other players or to work collaboratively with them), but perhaps less as Killers (playing destructively, as this would affect gameplay for other learners).

4. POST-GAME FACILITATION AND ONGOING CONVERSATIONS

We have had participants who spent the entire game trying to solve a single coding challenge in the Software developer's track (not great for the bank account), participants who "job-hopped" out of curiosity (not great for career progression if done without planning), and even somebody who tried to see what the game would be like if he did absolutely nothing at all (he was bored to tears and came back to the game after 2 rounds). These outcomes hold a mirror to real world consequences, and are good as conversation starters on the practicalities of life.

Indeed, at the end of the day, the actual in-game results matter less than understanding the "why" of decisions and emotive responses to particular situations. For example, in the Business and Entrepreneurship track, the participant takes a great amount of financial risk with no assurance of success in exchange for autonomy, the freedom to exercise entrepreneurial creativity, and a huge pay-off for the few players who succeed. Different participants may find taking that risk exciting, stressful, or even plain illogical – and that would be a useful gateway into discussing real world job preferences.

Each participant then takes away something unique from the game; the game master-facilitator links that takeaway back to the relevant research that was gamified and built into the Career Design Life Game. Learning is further reinforced with a post-game handbook and the deeper conversations that are possible with the game facilitators. In the Singapore context, career coaches at government-backed centers are also available to continue the career and re-skilling conversation in the real world.

5. CONCLUSION

There are many possible applications and expansions to this Career Design Life Game, including expanding the range of jobs available, and building in scenarios like recession and structural unemployment. Through discussion with other more experienced edu-larp professionals like Mads Lunau of Østerskov Efterskole, we have also built in game mechanisms to

allow for multiple plays, so that participants get to experience more of the game world. I hope that this game will find widespread application and benefit many people in today's VUCA world.

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Wonder Cards Storytelling: Imagination, Storytelling, and Role-playing in the Creation of Objects, Spaces, and Experiences

Abstract: This article explores storytelling and role-playing as resources to create objects, spaces, and experiences in the field of design. To this end, we present *Wonder Cards*. The game is an "imagination instrument" that, through distant analogies (de Cruz and de Smedt 2010), assist in the development of narratives. A tale needs to arouse feelings – empathy, love, fear, nostalgia, and many others. The materiality of this abstraction helps the individual generate notions of belonging and temporality for himself and for others (Pallasma 2012). Human beings express themselves through objects and spaces: what we call our material culture. They are an indispensable part of the materialization of sensations and affect. Accordingly, magnificent tales create memories that express the objects and spaces invented. Objects and spaces within an intrinsic narrative create memory. Memory helps construct and preserve cultural and personal identity, since living itself is a constant movement toward recollection (Cardoso 2011). Therefore, the merging of objects with subjectivity is exceedingly important to culture construction. Nonetheless, how does one create these tales? Structures can facilitate this creative process. This article presents the constitutive elements of our creative tool, the implemented experiments, discussions, and debriefings (Atwater 2016) derived from the use of the card game on workshops and design classes at Pontifical Catholic University of Rio de Janeiro. These activities with participants, objects, spaces, and experiences are explored by the creation of narrative scenes and storytelling resources through fantasy (Barthes 2013) and role-playing (Bienia 2016) and by using the *Wonder Cards*. This union enables the participants to live situations removed from the creative environment where they usually work, thus stimulating creation in new situations and imaginary narrative environments. The *Wonder Cards* assist in the construction of tales, which inspire the development of objects, spaces, and experiences by the participants.

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1. INTRODUCTION

The following article arose from the initial reflection about how our knowledge defines and limits us creatively. It is assumed that when we are confronted with a problem or are demanded upon creatively, we work these questions with our repertoire, and thus, we limit innovation capacity. This restriction occurs because we apply existing solutions, adding only small advances. The questions that guide this study, inspired by the work of Hélen de Cruz and Jóhan de Smedt (2010) are: How can we go beyond creative limitations caused by our conceptual limits based on existing knowledge? How do we bring together reason and fantasy to pursue ways initially unimagined? How do we use narrative and role-playing to expand these visions?

The present study investigates education and the development of creativity by exploring non-linear thinking, distant analogies, role-playing, and connections between reason and imagination. This exploration is inspired by the theories of the romantic poets writing about imagination, in particular Friedrich Schlegel and Novalis, the reflections of Roland Barthes about method, the theories about creativity by de Cruz and de Smedt (2010), and the definitions of role-playing by Rafael Bienia (2016). Several of these concepts are considered alongside the conceptual structure that we define as Wonder Design. To explore these ideas, we performed a series of experiments with a card game aimed at expanding creativity called *Wonder Cards* and its "Storytelling" expansion. These experiments took place mainly at Pontifical Catholic University in Rio de Janeiro, Brazil.

2. THEORY: REASON, POETRY, SCIENCE, AND IMAGINATION

By the end of the nineteenth century in Jena, Germany, a group of poets, philosophers, and scientists exchanged ideas and experiences. Schlegel's words sum up the main concept shared at the meetings: "All art should become science and all science art; poetry and philosophy should be made one" (Schlegel 1997, 38). They aimed to end the existing separation between reason and imagination, thus releasing creative potential. This romantic tenet of uniting reason and imagination inspires us, for it enables creativity to expand beyond the rational field; however, this does not happen spontaneously.

Schlegel himself wrote about the necessity of a method that combined poetry and philosophy, and was based on experimenting, stating, "The sphere of the combinatorial spirit is quite undetermined. But there must be a method according to which one can proceed. This method will be experimentation" (as cited in Chaouli 2002, 109). For this connection between diverse already existent concepts and the emergence of new ones to occur, it is essential to blend practice and structure. From this union, we developed a creative card game, *Wonder Cards*. Before describing the game, we will discuss the theories that supported its conception.

2.1 Creativity and Distant Analogies

Before proceeding with our reflection about the enhancement of creativity, we need a working definition of the term. In this paper, we will therefore understand creativity in the sense proposed by Margaret A. Boden, who states, "Creativity is the ability to come up with ideas or artifacts that are new, surprising, and valuable" (Boden 2004, 1). Boden's definition of creativity works well with the theories of de Cruz and de Smedt about creativity and thought, upon which we have built our conceptual framework. These authors analyze the influence of conceptual presuppositions -- distant analogies and ontological expectations -- on thought processes, in order to understand their role in creativity. According to the authors, the knowledge and expectations that we hold about how things are -- that is, our world views and interpretations -- influence our ways of thinking and creating: existing conceptual spaces constrain creativity to an important extent. If our thoughts and knowledge can limit our creativity, how may we overcome such limitations? Stories point to a way out, as "distant analogies may have been of crucial importance to move away from well-trodden paths" (de Cruz, 2011, 187). The authors also state that "a near analogy is one in which target and source come from the same or closely related conceptual domain[s]. In a distant analogy, target and source come from widely diverging domains" (de Cruz and de Smedt, 2010, 5). Thus, distant analogies escape from the imaginative common sense, because they bring together widely separate or disparate elements. These are the kind of analogies that we propose to explore through the *Wonder Cards.*

2.2 Fantasy, the Culture of Project, Wonder, and Role-playing

Roland Barthes expatiates on method and fantasy. To him, method "implies good will by the thinker" and "a premeditated decision" (Barthes 2013, 5). When a person wants to develop something with established objectives, this person will possibly follow the already plotted route, since there are no open spaces to get lost or to follow in unknown directions. Instead of a method, Barthes chooses to focus on culture, which he describes as "thinking under the action of selective forces, a training that puts the player's unconscious at stake" (6-7). Among these forces, Barthes highlights desire and fantasy as working on the individual while they act according to this culture when researching. This opens up possibilities of diverse paths inside the project, in contrast to method, which guides the researcher inside routes deployed in the same semantic field ruled by similarities and close correspondences (12). We aim to stimulate desire and fantasy forces with the *Wonder Cards* imaginative tool. With the cards, we seek to avert pre-existent concepts and definitions and open the space to fantasy.

How do we foster imagination and desire? How does the "wonder" encourage creativity and bring reason and imagination closer? Bearing these questions in mind, we wrote the article "Wonder Design and the Exploration of Senses and Imagination," where we presented the initial concepts and the inspirations for what we call Wonder Design, "associating romanticism, enchantment, imagination, and senses" (Rezende, Araujo, and Portinari 2016, 32). By doing so, we tried to stimulate the creation of concepts and projects that spur imagination, creativity, and the sense of "wonder." By "wonder," we mean enchantment, amazement, and a sense of the uncanny, that is, elements which awaken senses, emotions and curiosities in the individual. Our idea was to dissolve certain rational knots in the process of design and to allow a greater freedom of creation. Afterwards, we embraced this concept for role-playing through the expansion "Storytelling." Here, we invoke Bienia's definition of role-playing: "Role-playing is pretending [to be] a character living in a shared story world, and as agency, it requires all actors at a game session to collaborate" (Bienia 2016, 43). We tried to expand the imagination process and to allow the creation of objects, spaces, and experiences through the players, using narrative as support.

3. *Wonder Cards*: Instruments of Distant Analogies

The *Wonder Cards* are instruments of imagination aimed at inspiring concepts and projects. They are a group of cards structured into categories around a basic rule: blind picking. This way, when picking cards, a map of words is generated that, at first, seems illogical. However, this incoherence sets a challenge for the one who picked those cards. Its inventive powers lie in simplicity because it stimulates distant analogies. The traditional deck is made up of 54 cards split into 5 categories: Imagination, Sense, Emotion, Object, and Space. Here's an example: in the traditional way of playing, called Sequence, the player picks five cards, one of each category. For instance: Imagination (Emotional), Sense (Smell), Emotion (Fear), Object (Sticker), and Place (Earth). Using these elements, one must think of an idea which brings these concepts together. How, then, can one think of a sticker that creates fear through smell? How to do so by stimulating the emotional experiences of who is watching? And how to connect the sticker to the selected place, Earth? How to interconnect these different elements? The cards are a creative provocation, for they bring together distant analogies (de Cruz and de Smedt, 2010). This conundrum, brought upon by the comment above, is special because it focuses on the user, object, and space through a personal perspective: the desires and emotions of the person. We stimulate, then, a vision of a project based on the sense experience one has with the world around oneself, and then materialize it in space using artifacts.

4. *Wonder Cards Storytelling*, Experiences, and Further Research

From the basic structures and categories of *Wonder Cards*, we developed other modules aimed at exploring narrative elements and including role-playing, thus aiding in the process of creating stories, objects, spaces and experiences. We created the modules for the Storytelling expansion: Genre, Characters, and Events. The category "Genre"

explores narrative genres. There are 7 double cards (a total of 14 genres) in addition to a free choice card. "Characters" is composed of 14 double cards, totaling to 28 characters, in addition to a free choice card. This series aims to stimulate empathy among the players by adopting different personalities and to use this feeling to create stories. The third category, "Events," asks players to connect the events to the characters, all according to the narrative environment suggested by the genre cards. Combining these three narrative categories, and using cards from other *Wonder Cards* categories, the players must incorporate such concepts and create a playful narrative structure. To assist them, we developed support materials named "Sheets of Imagination." Each sheet of paper presents a different playing mode. There are modes focused on the creation of backgrounds, objects, spaces, and stories. The players, according to their own necessities, may choose to focus on developing only one of these elements. In the main mode, named "role-playing," the players create the backdrop, the physical spaces, the objects belonging to this place, and a narrative situation that encompasses the characters and these elements. Afterward, they play the characters and live the story they have created.

The experimental applications occurred between 2016 and 2018, involving open public workshops and classroom activities with design students at Pontifical Catholic University of Rio de Janeiro, Brazil. They happened in the following way: the cards and imagination sheets were presented to the players, groups of 4 to 5 people. Participants had 15 to 20 minutes to draw the cards and create stories. We observed and registered the proceedings in audiovisual form during the process. Once the card session was over, we had a debriefing session, talked about the experiment, and the participants made suggestions. Over these experiments, which generated dozens of stories and had more than a hundred students participating in them, more complex imagination sheets were developed, which incorporated more categories of cards. The dynamics of the experiments also changed; besides creating stories, we also asked narrative games to be created

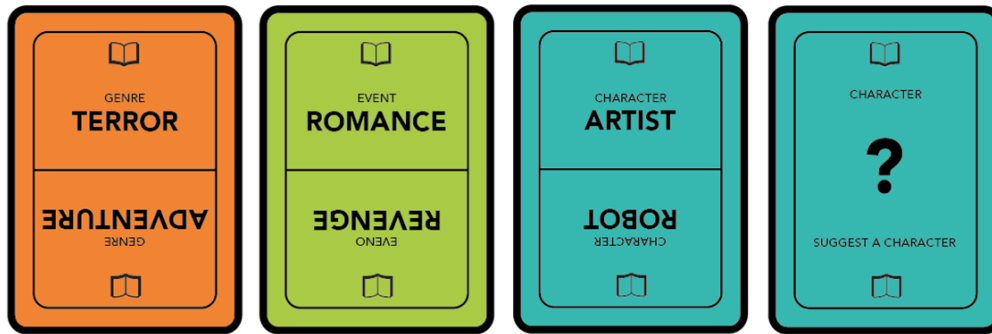**Figure 1:** Example of a Mode Sequence game, using all five categories.

Figure 2: Example of cards from each module (Genre, Event, Character) and Free Choice.

in which the players, after developing the structure of the game, switched games, with each group playing the game developed by the other group.

We highlight some comments of the players that happened during and after the activities. One participant said it was "challenging but very good, because it takes away that feeling of looking at a blank sheet and not knowing where to begin" and also that using the cards randomly made him create a rather different story than the ones he was used to. Another person said, "I think that without the cards, the students would feel stuck and the cards made it possible for the imagination to flow" because they were "a wonderful facilitator; to create with unexpected elements makes you connect them easily to create a narrative." They also suggested that it would be great to use the cards to create characters, their backgrounds, and even role-playing game adventures. Below, we will describe in further detail some of these experiences.

For a certain activity, a group picked the cards: Fantasy (Genre), Garden (Space), Fear (Emotion), Object (Sweet), Murder (Event) and the cards of the characters: Mermaid, Pirate, Queen, and Fairy. They created a narrative situation: "In a universe where the world is a huge garden of sweets, a murder took place, which prompted fear throughout the kingdoms. The king was dead. To investigate the crime, the queen summoned the representatives of the kingdoms: The Mermaid from the Chocolate Milk Lake, the Licorice Pirate, and the Jelly Beans Fairy." In this narrative game, in a space full of sweets, each player takes a role. While they savor the treats, the role-playing happens until they collectively find out who the killer is and how everything occurred.

In another experiment, a group of players picked the cards: Surreal (Genre), Room (Space), Emotion (Nostalgia), Relic (Object) and the characters: Child, Man, Object, Living, and Psychologist (which they chose because they picked a free choice card). Through these cards, the group created a live action

role-playing game (larp): "A man is confined to a room where he talks to a mirror, which reflects him when he was a child. Meanwhile, a psychologist finds out what has been haunting him for all these years." The group created the space of the room and decided it would be necessary that someone played the role of the mirror (and they created the story and details of this object). The other players would play: the man, the child, and the psychologist. In the interpretations and conversations between the characters, they find out what haunts the man. During the experience of debriefing, the players came up with suggestions and modifications. For instance, in one of the activities, we began to include an "Event" card on the "Sheet of Imagination," for the players felt a narrative continuation was needed as an inventive support. During debriefing, they also reported that they had never created narratives of that kind, but the method of connecting cards made the creative process a lot easier and they invented stories that they never thought they could.

These experiments carried out with the cards, including the participants' suggestions, open up possibilities for future explorations in the RPG and larp fields, as well as research on innovation and other areas that explore creativity based on arbitrary elements and the stimulation of new connections through distant analogies. These experiments may also be used, for example, in situations of creative blocks in the creation of characters and backgrounds or for improvisational warm-ups previous to larp sessions. We intend, in future experiences, to test the cards with other user profiles than those of people essentially from the academic environment. We also intend to further our investigation by creating more open and collaborative forms of experimental design, opening room for new proposals and new ways of playing developed by the participants during the sessions.

5. CONCLUSION

The *Wonder Cards* and its Storytelling expansion explore the connection between reason and imagination; the cards are connected to inspirations from Jena's romantic poets, and they open up possibilities that go beyond those limited by ordinary reason. The concept that the cards are picked blindly, with the players not allowed to choose, takes the players out of their comfort zone. As de Cruz and de Smedt (2010) point out, the comfort zone is a tightened space, just like a prison, which reduces innovation skill, since the creative connections normally used are very much alike. The cards propose the incidental and the connection between different elements; they allow players to escape the boundaries that knowing and solving old problems impose on the creation process. By introducing the principles of role-playing and narrative, we allow players to explore the creation of stories as a narrative force. Therefore, they create settings, objects, backgrounds, games, and narrative experiences that emerge from the connection between their senses, emotions, memories, and references. These components are mixed with random elements deriving from the *Wonder Cards*, being challenged by the fantastic and wonderful. On such occasions, where the mastered repertoire is not enough and a new perspective is essential, creative leaps are stimulated and wonder happens.

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Case Studies as Tabletop RPGs

Abstract: For many college educators, case studies provide a relatively easy form of active learning to implement. Students connect with them and can see the application and value. There are resources for published case studies available for free online and they can be applicable to almost any topic. However, frequently, case studies mostly involve research that can be divided up among group members with perhaps a few thinking and discussing questions at the end. In this article, I introduce a method of implementing case studies using a tabletop framework, allowing students the agency to make decisions that have impact within the world of the case study. Approaching the case study like a tabletop role-playing game (RPG) provides a more interactive and realistic feeling format. In a tabletop RPG, generally the players specialize. They have roles that only they can provide. Similarly, students can become "specialists" on their part of the case study and bring that expertise back. They may take on the role of particular stakeholders within the issue they are addressing. This structure allows students to teach each other and also discourages "slacking" in which a few people do all the work for the group. This method can also allow for a "role-playing" aspect, in which a student is considering the decisions that are relevant to their specialty from the specialist's perspective. Also, in a tabletop RPG, there are many points at which the players need to make decisions that affect what happens to their characters in the follow-up. While there are many divided case studies, most of them do not change based on decisions made in prior parts. Due to the interactive nature and direct responses to student decisions, students can feel like their answers matter and get feedback about their choices. Depending on class size, length, and preparation, the results may come within a class session or between class sessions. Either way, their actions matter. These pieces together can give students a sense of ownership and agency over their work and improve understanding of complicated topics.

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1. INTRODUCTION

Case studies have been used in teaching for over one hundred years. They are particularly common in practical and advanced areas such as business, law, and medicine (Herreid 2011). In recent years, there has been an increased emphasis on interactive learning at the undergraduate level in a variety of disciplines, including science. Active learning has been repeatedly demonstrated to be more effective for student learning and retention (Freeman et al. 2014), but many instructors have struggled to implement it for a variety of reasons. Reasons given include a lack of familiarity; student resistance; lack of instructor time to modify courses and grade work; and institutional norms (Henderson and Dancy 2007). Case studies are a type of active learning that fits well into many science courses; they can focus very specifically on material that needs to be covered and they are frequently well-received by pre-health students, due to their perceived relevance (Cliff and Wright 1996; Herreid and Schiller 2018).

Case studies are all about teaching through telling a story (Herreid 2006). Most published case studies follow a format where the students first are introduced to a story. Then, they do some research and answer some questions. They may get more parts of the story along the way. At some point, they are asked to answer questions that involve opinions or decisions, such as diagnosing and treating a patient or deciding on the ethical course of action in a complex situation (C. Herreid 2006; Cliff and Wright 1996). Some cases introduce a role-play component in which students take on particular roles within the case, but these have also generally followed the same basic structure (e.g. Roen 2010; Chen-Izu 2002; Harden et al. 2014).

Role-playing of various types has also been making inroads into the college classroom in recent years through larp, case studies, and online role-playing (DeNeve and Heppner 1997; Childress and Braswell 2006; Torner 2016; Vanek and Peterson 2016). Role-playing can be a very successful active learning method with high levels of retention and student engagement (DeNeve and Heppner 1997). These exercises also allow much higher levels of agency than activities based on prewritten worksheets, even ones in which students make important decisions. However, many of the larp-related approaches are hard to implement in a class focused around upper-level science. There are limited appropriate roles available for such scenarios. In addition, these classes require high levels of detail on very specific areas.

Tabletop RPGs occupy an area that can be somewhere in between these open-ended live-action experiences and the highly railroaded case studies. While there are certainly exceptions to this model, in most tabletop RPGs, players navigate a world that is

created or moderated by a game master (GM). They make decisions and take actions by communicating those actions to the game master. The game master either directly decides the outcomes of those actions or uses some form of mechanic to adjudicate the outcome. From there, the players can respond to this outcome with further actions (Delmas, Champagnat, and Augeraud 2009). Tabletop RPGs have been introduced to the classroom (Lopes 2015), but there are relatively few documented examples. In this article, I introduce a method of implementing case studies using a tabletop framework, allowing students the agency to make decisions that have impact within the world of the case study.

2. METHODOLOGY

Like other case studies, the ones discussed here start with a story (Herreid 2006). In order to get to the story, the students need an understanding of the relevant background. The examples used here come primarily from a medical physiology course taken by Masters students and upper level undergraduates. These examples mostly focus upon the diagnosis and treatment of disease. These case studies have also been used in a course on nutrition and food insecurity in America, where they primarily focused upon community level interventions. Relevant background reading is assigned ahead of time to prepare students for the case. After reading the material, students answer online discussion questions. The material is intended to provide a general background and framework, not to focus on the issues of the specific case. For example, students might read chapters on heart function before undertaking a case study about heart failure. When students arrive in class, I begin with a short lecture. The lecture focuses on the areas of the reading with which the students struggled or about which they asked questions in response to the online discussion board.

Once the lecture is over and students have had a chance to ask any additional questions, I introduce the case. The introduction to the case is a written document telling the story of what has happened so far and giving information for the students to pursue. From this initial story, the case lists a set of topics to research and explain. The students work in groups of four or five to approach the case. They maintain consistent groups throughout the semester, but have opportunities to change roles (Michaelsen, Knight, and Fink 2004). Students provide feedback to each other multiple times during the semester using CATME (Loughry, Ohland, and Woehr 2014). That feedback is eventually used to modify their grade, but with early feedback and support, very few students wind up receiving unsatisfactory feedback

from their peers in the end. Once all the students have read the case, they decide on specialties within their group. For some cases, the research topics are explicitly divided by specialty; for others, the students divide the topics as they see fit. Then, the students will do research independently and become "experts" in their area. Depending on the format of the class, research may be done during class time or outside of class.

Once the students have done their initial research, they come back together and share their information. After this, they work together to make initial decisions. In a diagnostic case study, these frequently include requesting tests. These decisions may also include whatever immediate care the patient requires. Once they have made this initial decision, they report it to me as a facilitator (or game master), and I provide them with the outcome of their decision. The case studies have prepared outcomes for the most common decisions, but the facilitator must create new ones for unexpected decisions. They then research this outcome, and use that information to make further decisions until they have reached a satisfactory outcome. In the case of diagnostic case studies, this would be their final diagnosis and treatment plan. At this point, they write up a summary of their final actions, decisions, and outcomes, as prompted by guiding questions. The final written portion, along with their research along the way, are the components that are graded for the class.

3. EXAMPLE CASE STUDY

An example of this method is one of the case studies on the digestive system used in the Medical Physiology class. Before the class, students read three chapters on secretion and absorption in the digestive system. This reading focuses on the roles of accessory organs like the liver, pancreas, and gall bladder that make or release enzymes and other substances necessary for the digestion of food. After reading these chapters, they answer discussion board questions online. These include a short essay question (similar to what one might find on an exam), a question about what they found particularly interesting in the chapter, and a question about what materials with which they struggled or found difficult (C. F. Herreid and Schiller 2013). I use the third question and any confusion from the essay question to construct a short lecture. This lecture gives a brief overview of the topics, but mostly focuses on the areas of student concern.

Once the lecture is over, the students receive the case study. The case study contains the following description:

A 36-year-old man was first seen in the emergency room at 6 PM on 4/27. He stated that at approximately 4:15 PM this afternoon he had felt a sharp, severe pain that increased in intensity for about 45 min and that had since remained constant. He had never before experienced pain of this type. He was sitting quite still in a chair, and when he moved to an examining table, he stated that the pain worsened. He looked pale, sweaty, and sick. His respirations were shallow, and he stated that deeper breathing was more painful. His blood pressure was 100/60 mm Hg (13.3/7.9 kPa); his pulse was 110 and regular; and his temperature was 37.5 C. Significant physical findings were limited to the abdomen, which was rigid to palpitation. There was tenderness (pain) when the epigastrium was firmly pressed; when the examiner's hand was suddenly removed, the pain was momentarily increased (rebound tenderness). Laboratory blood tests have been performed, and you are waiting on the results.

After this description, a number or specific topics from the above are called out for further research. Within their groups, students decide on the medical specialties that they will represent and divide the research among them appropriately. Once they have completed this research, students are asked to decide on the first test they want to run and asked how they would treat this patient while they are waiting for test results. After they turn in those answers, they receive blood work, the results of the test they ordered, and an update on the status of their patient. They research these outcomes according to their specialties and record those results. From there, they may choose to order additional tests and additional treatment until they reach a final diagnosis and a treatment plan. In this particular case, the patient has gallstones, which are causing pancreatitis. If they do not put the patient on IV fluids, with an order not to eat, the patient will develop more severe symptoms and may develop dehydration. In order to diagnose this patient, they will need to do some sort of imaging to see the gallstones and blood work in order to detect the pancreatic enzymes that are being released into his system due to pancreatitis. There are several possible options for treatment plans, but most will involve the removal of the gallbladder to get a satisfactory outcome.

4. STUDENT RESPONSES

Overall, student response to these case studies has been extremely positive. Students are engaged both with the research and in active discussion about what to do next. They frequently express excitement or nervousness about the outcomes of their decisions. On course evaluations, an average of 80% of students described the case studies as "very effective" (the highest rating), while another 8.5% described them as "effective." 74% of students said that the course using these case studies "helped them to think independently about the subject matter" more or much more than other courses.

Most of the student comments on the cases have been positive. Some representative comments include:

> The case studies are extremely helpful in understanding the material better and making sense of body systems, while connecting different ones together.

> I enjoyed this course a lot. Instead of hearing a lecture, I got to practice my skills in problem solving with my fellow students like I would be doing as a physician one day.

> I really liked the case studies that were a part of the class because [they] really helped me to go step by step to diagnose our patients.

> I felt like [the TV character] House!

There were some student concerns in the comments as well, but most of these related to the course structure, rather than the cases. The only complaint from the comments that directly related to the cases was "The case studies did get a little repetitive and class structure could have been switched up a little."

5. CONCUSIONS

Overall, this method has been successful in improving student engagement. However, there are certainly drawbacks to this method. The method is very teacher intensive, since the teacher is acting as a game master in response to team decisions. This method has been used with classes of 12 to 43 students. At the upper end of that range, student group progress was substantially slowed by waiting on the facilitator to receive and respond to their decisions. This probably could be alleviated with a teaching assistant who could provide students with the prepared responses, but the teacher would still need to be available to address unexpected responses, which frequently occur. In addition, the students need to be at a level where they are able to incorporate the material relatively independently. So far, I have only used this method in graduate and upper level undergraduate classes. While it could be adapted for lower-level undergraduate or high school classes, the students

would probably need a lot more guidance with the research component and might need additional support in coming up with appropriate decisions.

Despite these drawbacks, this method shows potential for improving engagement and student enthusiasm. This model can provide some of the advantages of classroom larp (Mochocki 2014), while fitting more easily into a science classroom setting. This provides a novel perspective for approaching interactivity, one that is different from both the available published case studies and from most role-playing activities currently available for the classroom. This method allows the intense and specific subject focus of case studies while providing some of the investment and interactivity of role-playing activities.

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