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## International Journal of Game-Based Learning

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# Case Study 3: Students' Experiences of Interdisciplinary Learning while Building Scientific Video Games

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## ABSTRACT

Game jams, hackathons and similar group game creation events have become increasingly popular over the past decade (Fowler et al., 2015). They provide new and exciting opportunities for education and research. They foster creative thinking and innovation (Preston et al., 2012), and strengthen project management and communication skills (Smith & Bowers, 2016); all of which are essential skills for working in industry (Pirker et al., 2016).

## KEYWORDS

Game Based Science Learning, Game Creating Skills, Game jams, Group Game Creation, Group Gaming, Scientific Games

## INTRODUCTION

Our case study explores students' experiences at the Game Lab Summer School (GLaSS) in Paris, France. GLaSS differs from traditional game jams because students work together over two months, rather than just 1 or 2 days. The objectives of GLaSS are two-fold: 1) to train students to work in interdisciplinary projects with team mates of different backgrounds; and 2) to create games that can be used for scientific education or research. The students are selected to provide an interdisciplinary mix of game creation skills (game design, programming, graphic arts, sound design) and scientific research skills (specifically biology). In 2015, 15 students from around Europe attended. In 2016, a further 21 students attended.

The entire program is run over 9 weeks. The first two weeks are dedicated to ice-breakers, lectures, and workshops on scientific games. The following two weeks are organized as game jams, in which the students work in teams and experiment with various ideas. Then the principal project begins: to develop a scientific game in 4 weeks, during which they have access to mentors in various fields of scientific research. The final week is reserved for showcasing the games at the Cité des Sciences, the largest science museum in Europe.

In GLaSS 2016, the students developed and showcased 4 scientific games. "*Lost in Nanoworld*" (Figure 1) is about a lost nanorobot trying to find its way and introduces players to nanophysics. "*Muscle Builder*" (Figure 2) involves creating and animating skeleto-muscular structures. "*Tiny*

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*Defense*” (Figure 3) involves destroying bacteria using different kinds of antibiotics, teaching players that bacteria become resistant to antibiotics over time. In *“Stigmer: Light the Way”* (Figure 4) players must work together to escape the maze; game metrics are recorded to enable research about cooperative behaviours.

Seventeen GLaSS 2016 students were interviewed about their experiences. Although students came from different academic backgrounds, they shared common goals: to learn about game design, expand their technical skills, and experience working with people from other disciplines: “I liked the diversity of people coming from everywhere. Before studying videogames, I also liked biology, so I found this cool. And yes, working with different people with different visions, it’s nice...”

The games made for the final project were built on the basis of putting into practice what the students learned throughout the summer school. Workshops and lectures established a basic understanding for concepts like “bioluminescent light”, but it was building the games and having to look into what exactly the term means that made the students fully understand the concepts introduced to them. Students said that they learned valuable new skills by working in interdisciplinary teams, collaborating with scientists, and testing their games with members of the public. They described

Figure 1. Lost in Nanoworld (© 2016, GLaSS. Used with permission)

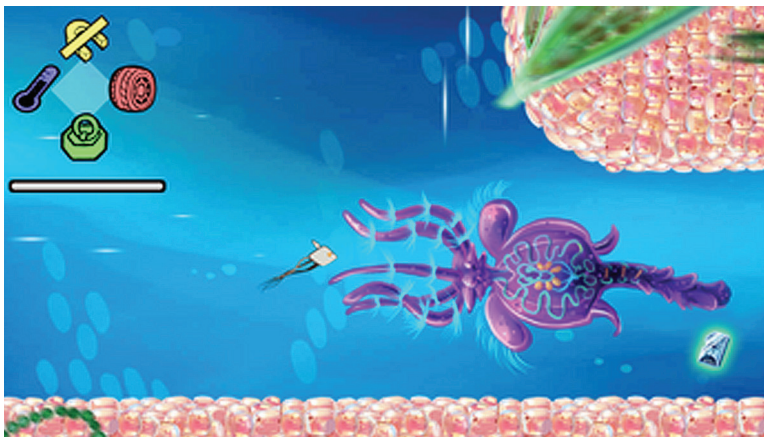


Figure 2. Muscle Builder (© 2016, GLaSS. Used with permission)

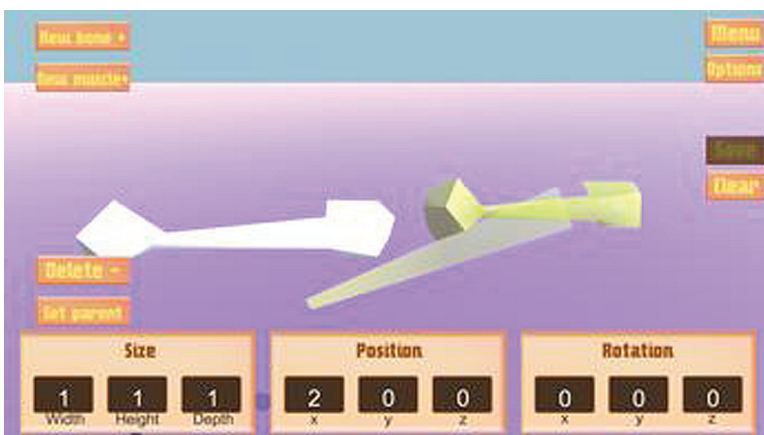
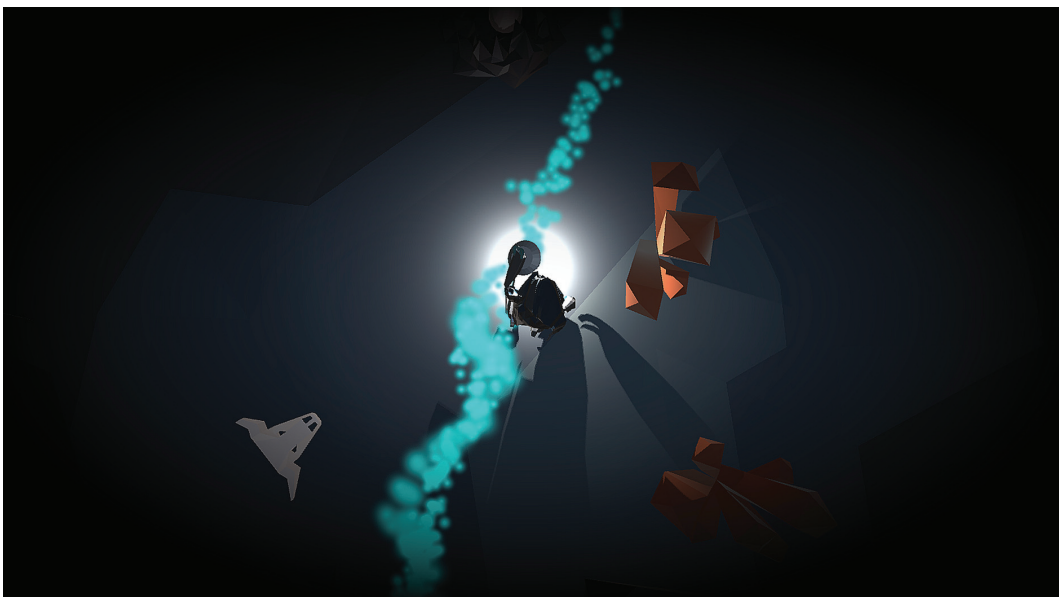


Figure 3. Tiny Defense (© 2016, GLaSS. Used with permission)



Figure 4. Stigmer: Light the Way (© 2016, GLaSS. Used with permission)



learning new things about science and gaining a new perspective on scientific games: “Well what’s cool is that it kind of pulls knowledge from people, and it could even help science. I think it’s the biggest thing we could do with video games and science.” Students also showed a good understanding of game design as they discussed the challenges of balancing fun and scientific accuracy when developing scientific games: “You really need to ask yourself, if I gamify this, is it going to work as a science thing? And if I make this scientific thing accurate, is it going to be fun? And for every single aspect, you need to ask yourself that.”

Reflecting on the students’ experiences and their own experiences, the GLaSS organisers share 7 tips about what works well in a summer school:

1. **“Science In, Science Out”:** We use this notion to explain that purposeful games should both use and produce facts, rather than simply using science/ history as a backdrop. Conversely, *gamification* (adding feedback elements that you typically find in a game such as achievements/ points) is not the same as having game mechanics at the core of the experience.
2. **Form Interdisciplinary Teams with a Balance of Subject and Game Creation Knowledge:** Recruit a balance of students, and ensure that the teams include at least one subject specialist. Mixing international students also helps mix perspectives.
3. **Have Expert Mentors be Fully Present During the Game Creation Process:** Mentors are often very busy with other commitments, but they needed to be fully present so as not to hinder their team’s productivity.
4. **Be Careful that Recruitment Covers All the Aspects of Game Creation, Without Overloading the Bases:** For example, we found that a mix of 1 game designer, 1 graphic artist, 1 coder, 1 subject specialist, 1 project/communication manager works well. Strong project management on each team increases the chances for success.
5. **Structure the Summer School Around Teaching Participants to Mix Their Skills:** The toughest part of this endeavour is enabling students to think outside of the “traditional” constraints of their craft and to understand each other’s skillsets. Hands-on work, at least as a complement to lectures, empowers and familiarizes students with the content.
6. **Use Game Jams as a Way to Ideate Concepts and Help Find Teams that Work Well Together:** Don’t count on game jams to create full-fledged purposeful games, but they do allow students to explore new concepts in advance of the final project. Teach and practice a fast prototyping and iteration process. It’s also a good idea to integrate playtests both within groups and with the public as a way for students to get outside feedback on their work.
7. **End the Summer School with a Public Showcase:** This focuses the students’ attention on their goal and motivates them to have something they can be proud of showing.

## ACKNOWLEDGEMENT

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# Call for Articles

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### MISSION

The mission of the **International Journal of Game-Based Learning (IJGBL)** is to promote knowledge pertinent to the design of Game-Based Learning environments, and to provide relevant theoretical frameworks and the latest empirical research findings in the field of Game-Based Learning. The main goals of IJGBL are to identify, explain, and improve the interaction between learning outcomes and motivation in video games, and to promote best practices for the integration of video games in instructional settings. The journal is multidisciplinary and addresses cognitive, psychological and emotional aspects of Game-Based Learning. It discusses innovative and cost-effective Game-Based Learning solutions. It also provides students, researchers, instructors, and policymakers with valuable information in Game-Based Learning, and increases their understanding of the process of designing, developing and deploying successful educational games. IJGBL also identifies future directions in this new educational medium.

### COVERAGE AND MAJOR TOPICS

**The topics of interest in this journal include, but are not limited to:**

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