Building Sex-Specific Synthetic Lethality Networks

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The Combined Inactivation of Two Genes Leads to Synthetic Lethality

- Utilizing games in educational settings as an interactive medium to promote **higher-order thinking**, **social skills**, and **problem-solving skills**
- Games support learning through **engagement**, **motivation**, **interactivity**, **drill and practice**, and **content mastery**
- In the digital era, game-based learning commonly refers to the use of **digital games** as effective instructional tools which also help develop **digital proficiency**

[1] **brown1989situated**; **jan2016game**

The Benefits of Playing Video Games

Interactive

- Individuals respond to situations presented in games, allowing them to think critically and strategize

[2] **coller2009effectiveness**; **tomavska2022let**

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The Benefits of Playing Video Games

Interactive

- Individuals respond to situations presented in games, allowing them to think critically and strategize

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- Individuals become addicted to the hormone boost their brains receive when they achieve results

Exploratory

- Individuals are immersed in a world without boundaries, free to explore in any way they wish

[2] **coller2009effectiveness**; **tomavska2022let**

The Limitations of Implementing Game-based Learning

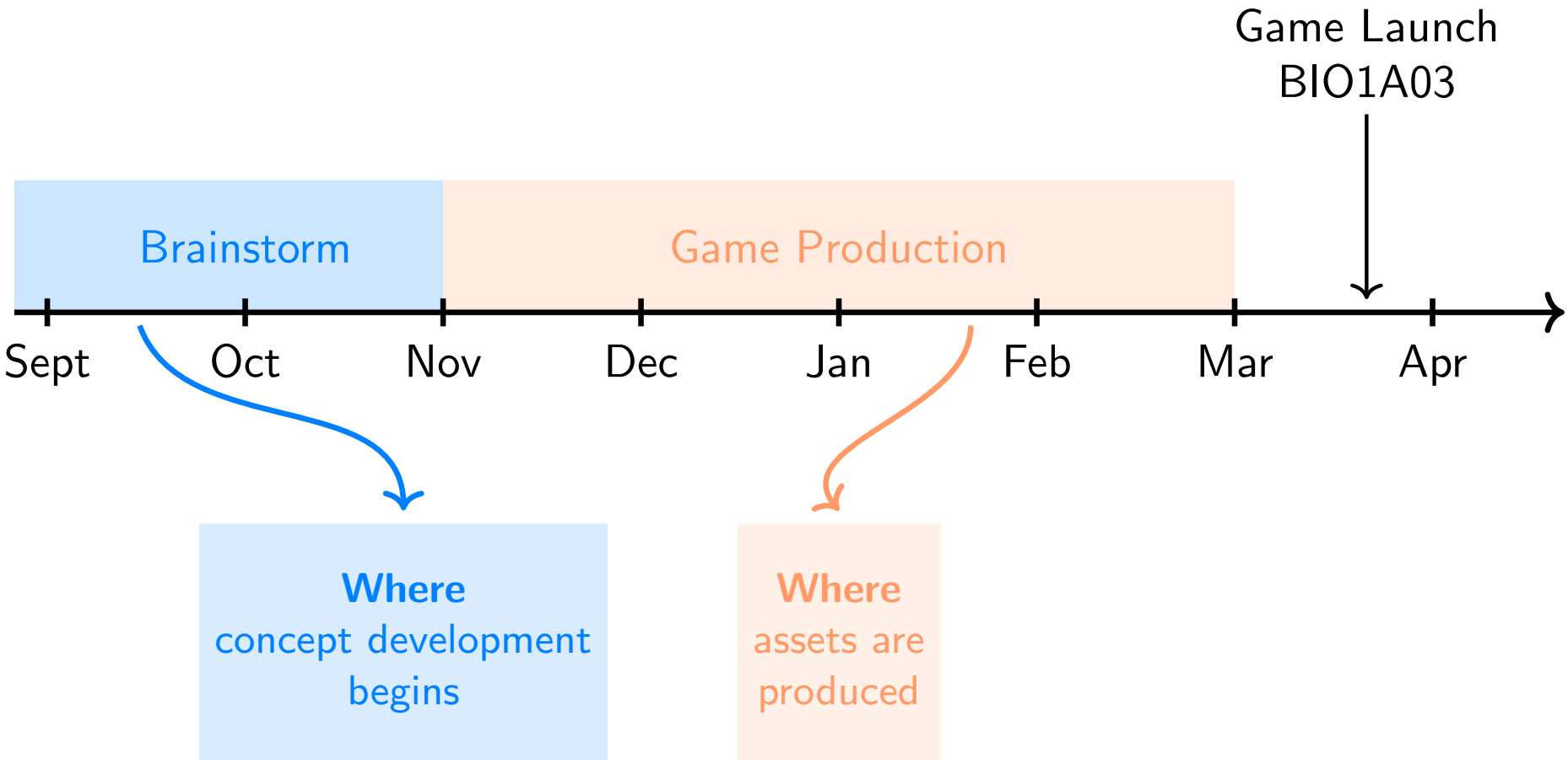
1. Many individuals believe that playing video games in a class setting will serve to act only as a source of entertainment and amusement rather than for educative purposes

2. Educators are rarely involved in the development of educational video games

3. Teachers lack the technological and pedagogical supports to develop their understanding of game-based learning in the classroom

[3] **lister2015gamification**; **mayer2010adding**; **molin2017role**; **fishman2014empowering**

Cells at War Game Design Process



Example Assets

Some Gameplay

Collecting Student Feedback

- NSSE survey questions assess the extent to which students engage in educational practices in the context of higher levels of learning

- 150 participants enrolled in BIO1A03 were asked 14 questions regarding opinions and attitudes on their current undergraduate education, as well as feedback on the use of 'Cells at War' for learning in the biology classroom

How Much Time Students Spend Playing Video Games

- 44% of students reported not playing video games at all

Types of Courses Taken at McMaster University

During the Current School Year, How Often Have You Done the Following

How Could Game-based Learning Help With the Following

- 22% increase in the number of respondants who felt that game-based learning would help connect their learning to societal/health related issues

How Much Does Coursework Emphasize the Following

If BIO1A03 Added a GBL Component, How Would it Improve Motivation to do the Following

- Overall increase in the number of students responding "very much" in all cases except memorizing course material

How Likely is it You Would Play Cells at War on Your Own Time To Consolidate Material Taught During Class

How Prepared Would you Feel if Given a Quiz on Pompe Disease based on Cells at War, Compared to Studying off Traditional Lecture Slides

Conclusions

1. Game based learning approaches have the potential to be utilized during lecture as interactive educational tools for students.
2. Implementing Game-based learning practices could improve student motivation to apply and analyze what they learn, and use it to form new understandings of concepts.
3. In a cohort where many students did not play video games, learning to play did not distract from understanding the content.
4. Not only benefits for the students playing the game, but also for the team of students and supervisors from different schools, in different programs, working in collaboration with each other.

Future Work

- Develop games based on different diseases to add to the Cells at War Suite of Games
- Expand the use of video games to other domains across STEAM (Physics, Music, Etc...)
- International collaboration between more Universities and Colleges

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