Arcade Game Design

Table of Contents

Challenge Description

In this exciting design challenge, *each* university will design and prototype a functional Arcade Game Design utilizing one or both of the Makey Makey boards provided. The Makey Makey allows you to easily connect the world around you to a computer, ChromeBook, or iPad, and make everyday conductive objects, like Play Do and Bananas, into touchpads. It is also possible to design more elaborate touchpads (i.e., switches) using items such as cardboard, aluminum foil tape, and sponge foam (i.e., polyethylene sheets). The back of the Makey Makey board can be used for additional keyboard inputs. Because the Makey Makey controls keyboard input, it can interact with computer program inputs, with IDEs such as block coding with Scratch or even JavaScript programming in a browser. For example, view the source code on the Makey Makey piano to see the JavaScript programming.

Arcade Games started in the 1970's with Pong being the first commercially successful game. In 2006 the Nintendo Wii came out and was applied to a variety of games to enhance player involvement and interactivity. The spirit of Arcade games live on through establishments, such as Dave and Busters. Well it is about time that we bring the spirit of arcade gaming to TEECA East! Who else is better equipped to design an arcade game then Technology and Engineering Education majors with their understanding of design, tools, materials, and processes. Let the competition, sights, and sounds begin!

Standards and Benchmarks

International Technology And Engineering Educators Association (ITEEA)

- Standards for Standards for Technological and Engineering Literacy (STEL)
    - **Standard 1:** Nature and Characteristics of Technology and Engineering.
        - **Benchmark Q**: Conduct research to inform intentional inventions and innovations that address specific needs and wants. .
        - **Benchmark R**: Develop a plan that incorporates knowledge from science, mathematics, and other disciplines to design or improve a technological product or system.
    - **Standard 2:** Core Concepts of Technology and Engineering.
        - **Benchmark T**: Demonstrate the use of conceptual, graphical, virtual, mathematical, and physical modeling to identify conflicting considerations before the entire system is developed and to aid in design decision making..
        - **Benchmark V**: Analyze the stability of a technological system and how it is influenced by all of the components in the system, especially those in the feedback loop..
        - **Benchmark W**: Select resources that involve tradeoffs between competing values, such as availability, cost, desirability, and waste while solving problems..
        - **Benchmark X**: Cite examples of the criteria and constraints of a product or system and how they affect final design.
        - **Benchmark Y**: Implement quality control as a planned process to ensure that a

product, service, or system meets established criteria.
        - **Benchmark Z**: Use management processes in planning, organizing, and controlling work.
    - **Standard 4:** Impacts of Technology.
        - **Benchmark S**: Develop a solution to a technological problem that has the least negative environmental and social impact.
        - **Benchmark ?**: PasteBenchmark.
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    - **Standard 6:** History of Technology
        - **Benchmark J**: Investigate the widespread changes that have resulted from the Information Age, which has placed emphasis on the processing and exchange of information.
    - **Standard 8:** Applying, Maintaining, and Assessing Technological Products and Systems.
        - **Benchmark N**: Use various approaches to communicate processes and procedures for using, maintaining, and assessing technological products and systems.
        - **Benchmark O**: Develop a device or system for the marketplace.
        - **Benchmark P**: Apply appropriate methods to diagnose, adjust and repair systems to ensure precise, safe and proper functionality.

Knowledge and Skills

- Design
- Sketching and drawing
- Ideation
- Research
- Teamwork
- Circuits
- Programming
- Electronics
- Fabrication and construction
- Time management

Procedures and Timeline

1. There will be two Makey Makey Webinars (please have some representatives from your university attend).

Makey Makey Webinar for TEECA East Students **Dates:** Sept 19 and 26 (choose one) **Start time:** 7pm ET **Length:** 45 minutes

Zoom link: Provided directly to advisors
Registration?: No need. Just show up and stay for as long as you like
Leader: Tom Heck, former VP for Education at Makey Makey
Purpose: Tom will share strategies, tactics, and tools for working with the Makey Makey so that TEECA participants can more effectively design and build amazing arcade style games.

2. The playing of the Arcade Designs will take place following the Technology Challenge and Professional Development workshop.
3. Each university will have an opportunity to play each Arcade game, and depending on the Arcade game, there may be some spontaneous competition between universities, small groups or individuals.
4. At the conclusion of the playing interval, there will be a polling system announced where each university gets a certain number of votes for what they think is the most creative and best designed arcade game.
    a. Each team will be supplied with the same number of tokens (votes). Your team can place all your tokens on one arcade game or you can split them up among several arcade games.
    b. A team is **not** allowed to vote for their own arcade game.
5. At the conclusion of the voting, winners will be announced.
6. All Arcade game designs will need to be disassembled after there is no more activity with them, and no later than that same evening.

Rules and Constraints

1. Each arcade game must fit within a space of approximately 350 square feet.
2. The design must be safe to all participants and spectators. For example, no fast or heavy projectiles.
3. In the event that a game is deemed unsafe by the coordinators, students, or faculty, the game will either be not played or modified until safe.
4. The arcade game must not harm any of the banquet room facilities.
5. The design can utilize the one or both Makey Makeys, computers or tablets, and additional electronic components.
6. To enhance the design, up to two Arduino boards can be added, **but at least one Makey Makey board must still be a prominent part of the design.**
7. Electrical relays are allowed, but must be safe to the designers, participants, and spectators.
8. Coding software, such as Makecode, can be used to create the Arcade Game Design.

Equipment and Materials

Team

1. Two Makey Makey boards.
2. Extension cords as needed.

3. Various materials for design.
4. Additional electronics if needed.
5. Laptops, iPads, and displays as needed.
6. Potentially helpful materials
    a. Phone cable or other insulated wiring as needed.
    b. Corrugated cardboard
    c. Aluminum foil tape
    d. Polyethylene Foam Sheets
    e. For custom parts
        i. CNC wood router
        ii. Laser cutter
        iii. 3D printer

Event Coordinator

1. Measuring tape
2. Polling system
3. Clip board
4. Duct tape
5. Projector system provided by the hotel

Evaluation and Judging

A polling system where each university has a certain number of votes will be utilized to determine the winners.

Learning and Resources

- See Makey Makey Webinar dates and times.
- **Arcade Game Designs** (both simple and complex)
    - https://youtu.be/jQZwnP0cvOQ
    - https://youtu.be/LzjgtsVxC60
    - https://youtu.be/J0el2A7zV_I
    - https://youtu.be/zaW_sMmQ5YY
    - https://youtu.be/5snnWKHGftc
    - https://youtu.be/7_7H_yQTYKU
    - https://youtu.be/i80ky0dIgmY
    - https://youtu.be/EZh83tDgWxg
    - https://youtube.com/shorts/jV2KhAWwBW0
- See resources at the bottom of the page at: https://makeymakey.com/pages/educators
- Makey Makey Course for Beginners

References

International Technology Education Association (2021). Standards for technological and engineering literacy: The role of technology and engineering in stem education. Reston, VA: Author. Available in electronic version from the ITEEA web site.