User Interface Design: Controllers for All

Year level band: Year 5 and 6

Description: In this lesson, students design and implement a new user-interface that allows a user to interact with a digital program.

Resources:

- Computer/laptop
- Scratch by MIT: https://scratch.mit.edu/
- Makey Makey
- Access to conductive materials (alfoil, playdough, etc).
- Access to craft materials (cardboard, glue, paper, paints, etc).
- Stationery: scissors, pencils, paper, etc.
- Example(s) of good and bad user-interface or game controller designs
    - http://www.baddesigns.com/examples.html
    - http://arcadesushi.com/worst-video-game-controllers
    - http://www.abc.net.au/news/2016-08-31/new-tactile-$5-note-coming-into-circulation/7797160 (new $5 note to include braille)

Prior Student Learning:

In this activity, students design a user interface for an existing Scratch project that either the teacher or student has found in the Scratch community, or for a more extensive project, students can design and implement their own Scratch program for a particular user, and include the design of the user interface as part of the design and development process.

If this lesson is for a program that the student has created, it is assumed that they have prior learning in designing and implementing algorithms and having had some exposure and experience with visual programming.

Digital Technologies Summary

This project involves students learning about user-interface design and the importance of considering the user when designing digital solutions, and that user-interface design is about considering the user's interaction with a solution and how to meet those needs. In doing so, students develop skills in designing a solution for a user with specific needs, and being able to communicate their design intentions - with sketch designs, as well as verbally by sharing their designs with peers.

By reflecting on their own designs, as well as other designs, students develop skills in being able to evaluate designs and provide constructive feedback.

Year	Content Descriptors

Year 5-6	Design a user interface for a digital system (ACTDIP018) Explain how student solutions and existing information systems are sustainable and meet current and future local community needs (ACTDIP021)
	Plan, create and communicate ideas and information, including collaboratively online, applying agreed ethical, social and technical protocols (ACTDIP022)

Element	**Summary of tasks**
Learning hook	The teacher begins the lesson by showing students some “bad” user-interface designs. Some of these could be humorous to spark interest. They could be local school or community examples. The teacher invites students to point out what they notice about the designs and discuss ways that they could design it better. *The teacher stresses the importance of considering the user when designing solutions. Computer Science is about people, as we are designing for users!*
Achievement Standards	They incorporate user interface design into their designs and implement their digital solutions, including a visual program. They explain how information systems and their solutions meet needs and consider sustainability. Students manage the creation and communication of ideas and information in collaborative digital projects using validated data and agreed protocols.
Learning Map (Sequence)	• Students consider accessible designs for a user to interact with a Scratch program they have made (or that has been selected to remix). • Using Makey Makey, they design and create their controller for their game. • Students come up with principles and justifications for their own designs. • Students share these designs online with peers for constructive feedback, that informs the final version of their interface. Students test and evaluate one another’s designs.

Learning input	The teacher displays a range of photos of user-interface designs - both physical interfaces (vending machine, coffee machine, bus ticket machine, car dashboard, game controller) and digital interfaces (tablet device/smartphone screen captures). The class reflect on the question: ● What makes a good design interface? ● What are the main differences between a digital interface (software) and physical (hardware)? The teacher selects one example and invites the class to think about how they might redesign the interfaces for someone with a particular disability, such as vision impairment. ● Does the design cater for this user? What would be the challenges for the user? ● How might they improve the design?
Learning construction	The class are now asked to consider how they might design an accessible controller (using Makey Makey) for a person with a disability for a Scratch program that they have made, or a Scratch program that the teacher has selected.
	Students select and research a type of disability and design considerations that improve accessibility for this user. Students consider how they might design the physical controller for a user to make it more accessible for all users. Students are required to first design their interface with pen and paper and upload their photo to a shared drive/classroom community for peer feedback. Using this feedback, students design their final interface and begin using available craft materials to construct it, in combination with the Makey Makey. If a 3D printer is available, students could use this technology with their designs. However, craft materials are also suitable. This section could possible be divided over 2-3 lessons.
Learning demo	Students showcase their designs, in combination with the program that they have created. Students have 5 minutes to explain and “pitch” their designs to their peers. Students need to explain: who they have designed the controller for; the features of the controller and justifications for the design decisions they have made. After this, students test one another’s designs.
Learning reflection	Students reflect on their initial designs and the feedback they received, and reflect on how they used this feedback to inform their final design. They reflect on the progress that they have made in comparison to their first design, and how their learning experience has informed their understanding of designing for diverse users.

Assessment:

In this lesson, teachers could collect evidence of learning and progression by the form of their artefacts, including: design documents, presentation feedback, presentation recordings, photos of the final product and development stages.

	Quantity of knowledge			**Quality of understanding**	
Criteria	**Pre-structural**	**Uni-structural**	**Multi-structural**	**Relational**	**Extended abstract**
User-interface design	Standard controller - no consideration of the user.	A simple controller that explains general design considerations, but not necessarily unique to their user.	A controller with consideration made toward the user, as explained through a feature.	A controller that has considered the user through two or more design features supported by justification.	A controller that has addressed multiple user needs, with multiple features, and has a high level of complexity and justification for design features.
Design	No design used.	Basic design with no features identified.	Basic design with some features identified, but not linked to design justification.	Detailed design with numerous features identified and linked to design justifications.	Detailed design that brings in prior learning and/or independent learning beyond the task and possibly includes requirements, specifications, constraint factors.
Language	When describing their interface, no specific vocabulary is used.	The terms ‘controller’’ may be used as a general description.	The terms user-interface /interface is used as a general description.	The terms user-interface is used confidently with specific reference to learner’s work.	Specific vocabulary like ‘requirements’, ‘specifications’ and ‘constraints’ is used, going beyond the set language.

Teacher/Student Instructions:

To set-up the Makey Makey, visit: https://makeymakey.com/pages/how-to

CSER Professional Learning:

This lesson plan corresponds to professional learning in the following CSER Digital Technologies MOOCs:

F-6 Digital Technologies: Foundations

- Unit 4: Digital Systems

See: http://csermoocs.adelaide.edu.au/moocs

Further Resources:

Makey Makey projects and information: https://makeymakey.com/

CS Unplugged Interface Design: https://classic.csunplugged.org/human-interface-design/

Designing for users with disabilities:
https://www.nngroup.com/articles/accessible-design-for-users-with-disabilities/

Author: Rebecca Vivian