1. Name of the task:
   Fall warning watch

2. Why did you choose this task?
   A practical solution for a real life situation

3. Subjects covered from STEAM areas:
   Physics, computer science, arts

4. Target group (age range and size of the group):
   12-18 years old

5. Duration of the activity:
   2 hours (programming activity), 6 lessons including the theoretical and practical background

6. Key words:
   Acceleration, radio signals, radio, aesthetics, design, heath, security, design cycle, usability, design thinking

7. Key sentence describing context of the activity, followed by short description (200 words):
   Students make a watch that detects an elderly person who falls and sends a signal for help. Because some elderly people are not as familiar with technology as younger people

   The watch need to be effective and not give false alarms e.g., when a person wearing it waves their arm/hands etc.

   The students need to 3D design and print a wearable watch that needs to meet usability criteria through iterative cycles of design and research. The watch also need to be designed precisely so that the electronics parts including sensors and actuators fit perfectly and are protected e.g., during fall.

8. Description of the activity environment, including the list of materials and tools needed:
   2 Microbits
   3D printer and filament
   CAD (TinkerCAD or other free software/online tools)
   MakeCode for programming micontroller

9. Step by step, detailed description of the activity, including teaching and learning strategies:

Introduction of physical computing (micontrollers, microcomputers, sensors and actuators)

Introduction to 3D design and 3D printers (A facilitator helps students with the printing/CAD)

Introduction of theory relevant to usability and usability testing

Engaging students in iterative cycles of design. The students learn-by-doing and testing and debugging. Then they refine their designs until they achieve satisfactory results.

10. Learning objectives/competencies:
    Design thinking: Learn about usability and how to conduct usability testing to tackle real life problems

    Modeling and understanding the architecture of the physical system (microbit, sensors, actuators)

    Programming, evaluation, design, reflection, debugging and testing, translation of a design model into computational steps

    Getting a deeper understanding of physical phenomena like the difference between velocity and acceleration, how far radio signals transfer and how radio signals are transmitted and received.

    Working in a structured manner.

11. Evaluation/Assessment guidelines:
    Rubrics which focus on the creation of the correct model, make a list they used for the sensors and actuators, working iteratively (testing, thinking of sub-solutions), considering different solutions before they get started. Translating design into code. Quality of the research conducted to come up with unique solutions.

12. Lessons learned:
    Students become very engaged when working in personally meaningful hands-on activities. They spend more time on the task and will be more willing to research and find answers to the questions they have. Additionally, they become more independent and empowered and self-efficient to tackle real life-world problems.

    The project was received as a big success and students who participated in the project were interviewed by the local newspaper. The teachers were excited by the learning outcomes which touched several aspects from different disciplines including science, computing and arts.

13. Additional information/Links:

    https://maken.wikiwijs.nl/135434/Physical_Computing_geheel#!page-4913100

14. Contact person:
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