Changing Practice Microbot Technology

Summary This activity encourages the creation of teaching and learning activities to support an inclusive classroom through encouraging the development of STEM understanding. The chosen context reflects a popular theme in the modern world, creative robot dance and appeals to a wide audience. The result is a STEM activity more grounded in sound STEM knowledge principles and utilising creativity and collaborative learning in an inclusive classroom. The focus remains on high calibre programming, and developing skills, knowledge and understanding.

Objective Microbot Technology seeks to expand the application of technology through computer programming. The aim is to create a student friendly and inclusive context to support learning in computer programming though problem solving.

Materials Micro Robots; computers, projector and screen; floor space or large table to test robot program; flowchart software; booklet. The room should consist of five large desks and chairs for groups of four people with computer (up to a maximum of 20 participants).

Preparation MicroBots batteries are checked. The software installed on the computers and checked in advance. The trainer-computer with a PowerPoint presentation is loaded (to complement the workbook) and flowchart-programming software installed for demonstration.

Description The Project relates to previous learning in a range of subjects and application of existing knowledge. The activities also encourage teamwork, collaboration, discussion and exchange of views.

Changing Practice

This resource exemplifies how a STEM lesson might be reimagined. Initial approaches to STEM can often be activity based. Using robots as a means to inspire and engage students in programming, use of technology offers substantial educational potential.

Activity - original design

This is a robotic activity geared to movement in the form of a competition or race. The activity involved the programming of a robot to navigate a maze taking into account space, direction and distance. Programming commands include forward left, right, wait, stop and start. Students were required to program the robots using computers and trial their program to navigate a maze. After initial training, the activity was time-constrained to approximately 15 minutes. This added a competitive dimension to the activity.

Reflection to build gender considerations into practice

Success in this task often encourages speed and repeated trial and error in program design. Such tasks often result in a boisterous and forceful engagement with robot and maze to

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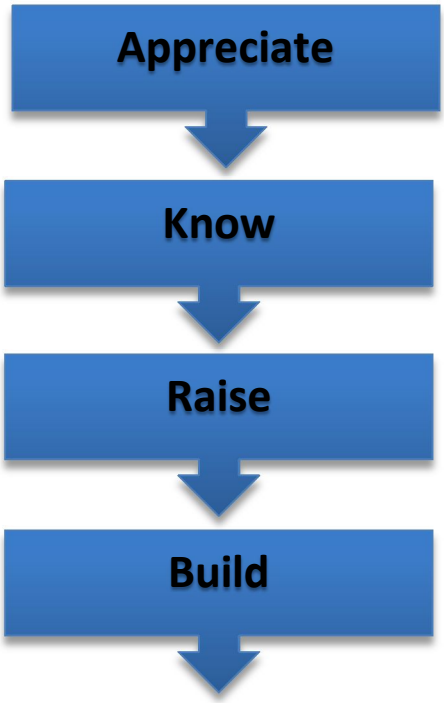
achieve the correct response. Most of the male students tended to cut corners and attempt to complete the task or activity at all costs, very often with lack of success.
For the most part female students applied a methodical and very focused approach before trialling the program. They had less enthusiasm for the competitive element of the task.

The first students to complete the task successfully render subsequent attempts less relevant, as the solution has been created by the winning group.

Building Informed Practice

The activity was redesigned to consider gender with the following considerations.

- Less competition and more structure.
- Greater focus on achieving a meaningful and creative outcome.
- Maintain time constraint but with no single correct response.
- Alleviate stress levels by promoting a more supportive, non-confrontational approach.
- Emphasise the mathematical and problem solving element by creating an algorithm as a sequence of instructions.
- Ensure the experience is more multidisciplinary in character.
- Promote a balance of study and application.
- Foster perceptual and symbolic learning and foster gross motor skills
- Retain kinaesthetic and experiential activities.



Activity Redesign

The activity has been redesigned in the following way:

- Students are grouped in teams to collaborate on a shared activity.
- The activity is designed to last 30 minutes and has the following structure:
    1. Explain the relationship between algorithm, flowchart and programming.
    2. Provide instruction on nature of commands.
    3. Create paper-based algorithms for simple robot movements.
    4. Translate algorithms into programs and run programs.
    5. Create a robotic dance routine.
- The program design of the dance routine is a shared task, which involves the combination of dance moves provided by all members of each team.
- Each dance is scored by the teams, identifying elements of successful program design.

Design and creativity is encouraged through:

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- Creating a path or dance for Microbot.
- Design of robot personality.
- Flexibility in resources to allow wide range of responses.

This approach encourages teamwork and gender inclusivity to sketch, plan and construct dance routines as a shared task, through a combination of dance moves suggested by all members of each team.
Use of the open-ended dance routine opens the STEM activity to include both the exploration of creative and expressive movement and the application of technology and mathematics.

The plenary therefore becomes a showcase celebration, which is a more inclusive experience where all responses are valued and challenged. Extension activities include possible costume design, or relating movement to music.

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