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Using Integrated Software Across The Curriculum

Blocks to Robots Proposal

Proof of concept.

This proposal is for a class where students gain a basic understanding of computer languages and how they can be applied to control simple robots. Students will progress through self-paced challenges where they will master loops, if statements, counts and functions (sub-routines). Students will gain the basic understanding that when given a command from the computer's software a robot produces a specific function. They will begin exploring robotics through the relationship between a computer program and simple robots using activities based on problem based learning. This is known as physical programming because it provides students with feedback that is tactile and formative. They will learn how to code by making 'smart' machines interact in their world. This supports a wide range of learning styles. Through my experience in completing this program I have found that children will have the ability to manipulate parts of this system to create a variety of objects and program software that results in an assortment of robotic functions. Marina Umaschi Bers has states that robots provide a link from concrete knowledge to abstract thought by exposing students to "bits" as well as "atoms" (Bers, 2008). This proposal is based on this theory; that when children are given the opportunity to create objects they construct new meaning from the experience (Bers, 2008).

Powerful ideas

Robotics provides opportunities for realistic interdisciplinary application of relevant content. Through teamwork students solve complex problems using a variety of representations. Students are encouraged to take possession of their tasks and will participate in reflective learning (Brown & Green, 2011). This proposal is based on constructionism which focuses on building to learn (Ackermann, 2001). According to Papert, students gain better understanding when they become more involved with their learning by constructing artifacts (Ackermann, 2001). Robotics provides the means to apply this type of environment (Papert, 1991). This program begins with Robotics I & II where children discover the interactions between the concrete and abstract environments in which they will be working. It ends with Robotics III where learners are asked to apply their knowledge. Students are encouraged to take possession of their tasks and will feel empowered by proposing solutions to real world problems using their inventions (Bers, 2008). This curriculum is based on building to learn. Robotics provides the means to apply this type of environment (Bers, 2008).

Student projects

Students will use variables in their code allowing the robot to make decisions based on data received by input sensors. The data will need to be received, stored and retrieved for further processing. The children will build robots that;

- detect a wall and stop using the touch sensor
- detect on object using the ultra-sonic sensor and grab the object using a claw
- use the sound sensor to begin moving

- Solve real world problems using robotics, children will be able to choose from
    - Medical
    - Manufacturing
    - Aerospace
    - Transportation
    - Cultural
    - Other
- Document their applications

One important skill introduced at this level will be documentation. Students will need to explain how the code is processing the information and present the documentation within the program. The skills developed during these challenges provide opportunities for inquiry based learning and understanding by design promoting the development of twenty first century skills.

Practical considerations

For a class of 24 students the following considerations should be in place;

- 12 robots of teach type are needed for the class because children should work in teams. This amount provides each child sufficient exposure to the project.
- Teaching children how to learn is emphasized. For this reason a variety of robotic platforms should be used including Lego EV3, VEX IQ, and Tetrix. This provides children the opportunity to explore an assortment of environments.

- 24 laptops are needed for the class. This allows students the ability to simultaneously build while the other codes the software.
- Access to the internet is required because research on the global issue they are designing a solution for needs to be researched.
- A room of ample size is needed to allow students the ability to test their designs in a safe manner.

References

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