

Background Information:

My professional development topic was called “Robotics Curriculum Integration”. I presented at the ACAMIS Technology Conference on October 17th. Due to the current pandemic, the conference had a hybrid model. Some participants attended live, at a school in Shenzhen, China, while others attended virtually. Most presenters were virtual.

Presenter Background:

Nansha College Preparatory Academy in Guangzhou, China
Total School Faculty, Grades 7-12: 77
Student Demographics: 100% EAL student body. Chinese nationals
Curriculum: American (NGSS, Common Core, and AP)
Presenter Role: 7/8 STEM Teacher and Robotics Coach

Conference Background:

ACAMIS Technology Conference
Participants: Teachers and Technology Directors from International Schools throughout China
Grades: Elementary, Middle, and High School Teachers
Curriculum: American (NGSS/Common Core) and International Baccalaureate (IB)

Standards Addressed:

I shared examples of lessons that integrated NGSS standards with robotics, especially focusing on the engineering standards.

These NGSS standards included:

MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristic of each that can be combined into a new solution to better meet the criteria for success.

MS-LS1-2 Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

MS-LS1-3 Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

MS-PS1-4 Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

The Common Core standard included was:

CCSS.Math.Content.7.RPA.2.c Represent proportional relationships by equations.

I also shared the following three websites to help people connect to their own curriculum.

- NGSS
<https://www.nextgenscience.org/topic-arrangement/mengineering-design>
- MYP Design
<https://www.mypcurriculum.com/design>
- FLL Standards alignment
<https://info.firstinspires.org/curriculum>

Summary of Project:

In the past years, I have presented with a team about how to run after school robotics clubs to prepare for robotics competition. Many times teachers have asked questions about how to integrate robotics into their classroom curriculum, so that became the focus of this professional development.

My goal of this PD was to share many resources with teacher to give them ideas on how they could integrate robotics, and then have them leave with ideas for how they would use robotics in their own classroom.

Pre-Question Survey List:

Before the session began, I asked participants to fill out a survey. Here are the questions and results.

What do you teach (elementary, middle school, or high school)?	3 Elementary/Primary 1 Middle School 1 High School 2 Middle and High School 1 STEAM
Do you currently have robotics equipment at your school?	7 yes 1 no
What robotics equipment do you have?	3 LEGO EV3 1 Sphero 1 Bee Bot 2 Microbit 1 Arduino
Do you currently do robotics as an after school club?	5 Yes 2 No, but we would like to start one 1 No
Do you currently use robotics in your curriculum (outside of a club or after school activity)?	5 Yes 3 No
What questions do you have about using robotics in your curriculum?	Just looking for ideas Want to explore more about Wet

	<p>Robotics</p> <p>Is Robotics Apt only for Comp sc students or for everyone?</p> <p>Interested in the actual title of the PD.</p> <p>How can I integrate this into my HS and MS curriculum?</p> <p>How best can you map math learning pathways through using robotics?</p>
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Unfortunately due to the format of the conference I was not able to reach out to participants prior to the event. With half of the participants viewing live, they did not all have computers to fill out the survey. I only got results from 8 participants.

From this survey, I learned that participants came from a wide variety of teaching levels (basic robotics in elementary to computer science courses in high school). Many have some background knowledge of robotics, through an after school club or resources already at their school. Some even use robotics in their curriculum already. However, there are some attendees that had little background or no equipment at their school.

Brief Description:

In this session, my goals were to talk about why you should integrate robotics, share tips for integrating robotics, share example lessons from both NGSS and IB curriculum, and finally share out resources for people to explore.

Outline of activities:

Introduction

First , I introduced myself and my background. I also covered the goals of the session, and invited all attendees to take the survey.

What is a Robot?

I asked participants to share their ideas on Mentimeter about what a robot is. Then I highlighted commonalities in their answers. Then I played the video on “What is a robot?” and the “Octopus Robot” to get participants to think about how we might broaden the definition of a robot. The goal was to get participants to think beyond the classic definitions and images of robots we may have from movies or strict definitions from competitions. By thinking of a robot in terms of completing a task for humans or having an input-output system, this can really open up how we may use robots in the classroom. It isn’t about building a toy or a car (as my students call it), but rather about interpreting a direction to complete a task for humans to make their life easier.

Meaningful Robotics Integration

I briefly tied in the SAMR Model, to challenge people to think about the depth to which robotics integration may be used. Robotics can be seen as a cool tool, and often schools will pay money just to have what looks impressive but not really connect with the content to transform the task. When used correctly, robotics can be used for some deeper connections, like modification or redefinition of a task. It is more just making a toy move; it is creating something that was previously not possible!

Challenges and Tips

I asked participants again to share on Mentimeter what their challenges with curriculum integration were, and very quickly we saw commonality in answers: time, money for equipment, support from administration. I shared some tips from my own experience, and also asked a colleague to share how he worked to get his administration on board with his program.

Curriculum and Lesson Examples (NGSS)

I shared links to NGSS standards, MYP design standards, and FLL standards alignment so teachers could start to see how robotics can fit in. Then I shared specific lesson examples from my classroom where I had used robotics connected to NGSS standards.

Curriculum and Lesson Examples (IB)

After looking at the NGSS standards, I invited a colleague of mine that works with IB curriculum to share a few examples from his classroom. This was very helpful, as many teachers wanted to see how robotics and specifically FLL could fit within the MYP design parameters.

Explore Resources

I shared out resources for teachers on Wakelet (China friendly version of Padlet). Teachers could view resources and explore deeper into lesson examples that might better fit their curriculum. These resources included lesson plans from various websites (NASA, Teach Engineering, Sphero), curriculum information from different platforms (Sphero, FLL, VEX, WRO), as well as virtual robotics platforms.

Share Ideas

The goal was for teachers to share out their ideas. Originally this was going to be in Breakout rooms, and then that was not allowed due to bandwidth. The second plan was for them to add on to Padlet, but then Padlet stopped working in China. The final result was that I had two separate Wakelet pages, one for resources and one for sharing ideas. However, since this was a new platform and we were short on time, no one had a chance to share out. This is something I hope to follow up with participants on.

NASA/Endeavor Resources:

I used many of the resources from different Endeavor courses to give participants ideas for how they can use robotics in their classrooms. I used specific NASA lesson plans.

The information I shared with participants came mainly from two different Endeavor courses: “The E in STEM” and “Coding, Robotics, and 1:1 Devices”.

From “The E in STEM”, I shared the engineering standards from NGSS that I had used in my own lessons. I also included a lesson plan from “Teach Engineering” in the resources.

From “Coding, Robotics, and 1:1 Devices”, I used the “What is a robot?” video and the “Octopus Robot” video. I also talked about the SAMR Model. Lastly, I included resources from NASA, FLL, Sphero, VEX, Microbit, Virtual Robot Worlds, and my own lesson plans that I developed during this course.

Here are the full resources shared with participants on Padlet/Wakelet:
<https://padlet.com/ewton2406/qneshkc50b91pspy>

Follow-Up Questions/Post Questions Survey:

At the end of the presentation, I first asked for contact information for the participants (name, school, and email).

Then I asked the following questions:

<p>How will you try to use robotics in your classroom?</p>	<p>Integrate it with CS for high school Trying to find direct links to GCSE computer science or KS3 Computer Science. Also lower school activities I will be using robotics as an extension to my coding lessons. Elective class and competition club class Not sure but for HS Still trying to figure that out, but these resources have given me a jumpstart! Geometry fundamentals with Sphero</p>
<p>How much do you agree with the following statements?</p>	
<p>I learned new resources that will help me to integrate robotics into my curriculum.</p>	<p>Disagree 62.5% Neutral 12.5% Agree 12.5% Strongly Agree 12.5%</p>
<p>I feel more confident integrating robotics into my curriculum.</p>	<p>Disagree 69.5% Agree 28.6%</p>
<p>What was helpful for you in this workshop?</p>	<p>Different ideas in PPT for Science and then also MYP and shared resources Resources to look through The presenters talking about their experience getting started with robotics So great Finding out about costs Learned about some resources Resources</p>
<p>What could have been improved about this workshop?</p>	<p>More audience interaction? I know it's hard when so many people and the presenters are virtual More student exemplar work As a beginner to robotics it was fine for me Less about curriculum and more about costs and projects More on elementary school side, outside FLL. We run FLL as an after school program/co-curricular</p>

Outcomes:

Content:

As far as the content of this presentation, I think it was very strongly connected with NGSS and IB standards. I wanted people to really see how robotics was not about playing around, but can really enhance how students interact with the standards. I believe the connection was clear and examples were given so that all participants could see how it could be used in their individual content setting.

In the survey results, it is very mixed. As far as the resources that were shared, many people said they disagreed that they learned new resources. However, in another question, the resources were the best part of the workshop! I think we had many resources shared, but not enough time for people to go through them. My hope is that after the presentation, people were able to go back and explore a bit more. This may also be connected to the fact that the participants had such varied experiences. I struggled a bit to give examples for IB Computer Science, since that is not something I personally have experience with. Also, I was trying to reach all participants, but clearly not all examples fit for all participants. It might have been better to have separate presentations tailored to elementary or secondary, rather than mixed.

Pedagogy:

In the presentation, I think I both demonstrated some good instructional techniques within the presentation and shared how I craft my own lessons with robotics as an example. I talked about the SAMR Model to stress that technology should be integrated in a meaningful way and get at higher order thinking skills. I also tried to get participant interaction through the use of Mentimeter. However, I was limited in how much I could interact, so I do not think this presentation was as good as it could have been in person. I really wish I had more opportunity to interact with the participants so that I could have brought out their own experiences and supported them in developing ideas. I think people appreciated the specific examples from my own curriculum, so that I could show how robotics can be integrated with specific standards. I described clearly what the task was the students were doing as well as how I assessed them.

In the survey, people did respond to some of the examples shared, but would have appreciated more demonstration of the resources. Perhaps a more hands on approach would have been better. If it had been a live demonstration, I would have had students participate in some of the lessons with robots, rather than just listen to them.

Overall Success:

There are many factors that led to the effectiveness of the PD. The conference format changed many times before ending with the hybrid model. Personally, I was not certain I would actually be able to participate until about 1 week before due to changing travel plans. It was a challenge for me to really develop a quality PD to meet the needs of the participants with so many changing factors, from presentation method to participation method and audience.

Additionally, I was very limited in terms of interaction. I was not allowed to use breakout rooms, and Padlet had complications on Chinese networks so I had to change up this format at the last minute. I had really wanted participants to share out their own experiences and ideas, but was told by conference organizers that I should keep me presentation to a keynote style instead. I could not see all of the virtual participants clearly while I was sharing my screen, and could not see the live participants at all.

Lastly, I had asked a colleague to share some examples from his curriculum since many teachers have IB rather than American NGSS curriculum. I was expecting him to quickly go through a few examples, but he spoke for much longer than I expected him to, which cut into the time for participants to explore resources.

That being said, there were some great questions asked in the chat that were successfully answered. We got really positive feedback in the chat box about the examples that were being shared, and people said in the survey that they appreciated the resources. I think we shared a lot of quality information, but it was just a bit much for the time allotted.

I have sent a follow up email to the participants that filled out the survey expressing that I would love for them to share what has been successful for them and also reach out if they have continued questions.

Connection to Readings:

I think this presentation was a mixed success. I believe that I did my best given the circumstances, but overall I was disappointed by the end result. In the readings from this course, I had built up a very clear idea of how I really wanted my presentation to be. Effective PD should be connected with what effective best practices, which includes active learning (DeSimone, 2011). Teachers should be involved in the PD, applying it to their own teaching, and the results should show in if they actually use the ideas. DeSimone suggests that there are many ways to assess the effectiveness of a PD, from a survey to interview afterwards. I had really hoped to have a very interactive presentation where I could support teachers in developing ideas, then follow up afterwards to check to see if they were successful in implementing it. Due to the online format and me being so limited, I tried to get interaction from participations with Mentimeter but it simply was not enough. There was not a good way for me to allow participants to share their ideas and for me to respond back to them on a personal level. I also was not able to push people to fill out the survey, and as a result was not able to follow up as much as I had hoped.

In addition, when I was told by conference organizers that I should present this keynote style, it threw me a little bit. As Berry explains, one of the problems with teacher leadership is the “symbolic role that teachers assume” (Berry, 2019). I have loved presenting at this conference the last few years because I do not have to feel like an expert, or that I am talking at people. I have really felt empowered by answering people’s questions from my own experience, and sharing my own struggles. By presenting this like a keynote, I felt I needed to put myself up as an expert, rather than just supporting other teachers in a similar situation by sharing my experiences. Berry talks about moving away from the traditional hierarchical leadership of education, and I much prefer being a leader from within a group rather than from the top.

That being said, I know that the presentation had a strong focus on content, and I will continue work on duration and collective participation by continuing to support the participants via email (DeSimone, 2011). An important feature of effective professional development is maintenance, or monitoring progress after the presentation is complete (Jenkins, 2010). While I did not get as much participation during the session as I would have liked, I will continue to put myself out there to support all of the robotics teachers in the ACAMIS organization.

Will teachers do these activities again?

Since many of the participants had already done some curriculum integration before, they will continue to do this. However, I do think they will use some of the resources shared to further what they are doing. Also, there were some people that were brand new to robotics. I think they were excited to have the resources with ready to go lesson plans, and there is a good chance they will try this out in their own classroom.

Works Cited:

Berry, B., Daughtrey, A. & Wieder, A. Preparing to Lead and Effective Classroom: The Role of Teacher Training and Professional Development Programs.

Desimone, L. M. (2011). A Primer on Effective Professional Development. Phi Delta Kappan, 92(6), 68.

Jenkins, A.A. & Yoshimura, J. Not Another Inservice! Meeting the Special Education Professional Development Needs of Elementary General Educators.

Appendix:

Presentation Slides

https://ncpachinaorg-my.sharepoint.com/:p:/g/personal/ecooper_ncpachina_org/EUhHeqcsXOIEoPhKtzEvaGEBuS8gU-Sgu1e0XoWKH5j6tQ?e=MqzWGp