Hands-on 1:1 Devices

Melissa Hinspeter

NASA Endeavor STEM Leadership

Abstract

As technology becomes more prevalent in the classroom through blended and personalized learning, teachers are asked to utilize web-based programs and ebooks, but are afraid that the hands-on element that makes science so enticing will lose its luster. I want to create a professional development opportunity to show teachers transitioning from science kit teaching to 1:1 blended/ personalized learning that the hands-on learning doesn't have to stop just because a device is in hand.

Hands-On 1:1 Devices

One common gripe teachers have when something new is put into the curriculum is that it will be more work to learn new material. In reality, the teachers just need time to adjust to the newness and work through the process. 1:1 devices and new web-based curriculum require professional develop that shows teachers the hands-on inquiry approach can enhance student learning using 21st Century skills (Applied Educational Systems, Inc.), all the while giving teachers more resources to enhance their lessons at the touch of a button.

How does your PD integrate NASA assets and/or content from Endeavor courses?

In my Coding, Robotics, and 1:1 Devices class with Sharon Mistretta, our first assignment was a personal reflection on the value of technology, and I would love to use this short article (see appendix A) as an opening activity in my professional development. It talks about the key components of the new cognitive science:

A. Deep conceptual understanding – facts and procedures are not truly learned unless the student has the opportunity to apply knowledge to authentic situations.

B. Learning is not improved simply by revamping teaching. Students must actively participate in their own learning.

C. It is the job of the school to provide learning environments where students can apply facts and procedures to solve authentic problems.

D. Teachers must carefully consider all students' prior knowledge to make connections from what they know to what they are currently learning. Misconceptions must be addressed and corrected before new topics are introduced.

    E. The role of student reflection on learning is crucial. Students must be given the

       opportunity to reflect on what they have learned and to express their knowledge and

       develop artifacts to exhibit learning.

My discussion post response to this article is a sample of what I want to convey once teachers

had a chance to respond using either Padlet or a Schoology Discussion Post:

       Knowledge is like a puzzle. There are so many pieces laying in a box waiting to be

connected to formulate a concept. Knowledge builds on previously learned information.

Technology at the fingertips of our young learners puts the learning directly into their hands.

       My school is a 1:1 project-based school using blended and personalized learning models,

teaching our learners to responsibly navigate their learning. Students in grade 3-8 use a learning

platform called Schoology. Teachers manage individual student content in this learning platform

by creating personalized playlists in grades 3-5.

       In the middle school where I work, the teachers provide project content for students,

while encouraging good character education, and the students build their knowledge-base using

multiple avenues of resources, including the internet. In my particular science class uses a

web-based program called Science Bits. The content is taught using the 5E Model, providing

opportunities to explore, practice, and create elaborating projects to demonstrate understanding.

The evaluation is set up to show knowledge through application and not rote memorization. The

questions within the evaluations are real-life applications that students are asked to

problem-solve. This does require the ability to search up information. This technology approach

builds my students' resourcefulness and critical thinking skills by requiring them to make

accurate search statements/questions.

Another trait that technology assists with is accountability, controlling actions, thoughts, and feelings so they align with personal and professional goals. Behaviorally and academically, students must be accountable for their actions in order to be successful.

One last trait that technology assists with is collaboration/communication. The workforce promotes collaboration with co-workers to build better programs or improve upon products. With the help of technology, people from across the world can collaborate within a single document to create a product, solve a world-wide problem, or just unite common beliefs. In my class, students are given multiple opportunities to collaborate on group projects using Google applications. After project requirements are communicated, students split up the tasks amongst their partners that must be completed to achieve a common goal. Using the Comments feature in Google applications, students can communicate questions and suggestions without manipulating a partner's efforts. Instead, the group members are supporting each other.

A knowledge economy requires resourcefulness, critical thinking, accountability, and collaboration.

"Technology is a liberation. I think the information age probably is the best thing to happen to the human race in human evolution. Now you have the equal opportunity to equip yourself through information and knowledge and express yourself as an independent mind (Weiwei, June 28, 2013)."

In the same class, we were also assigned to read an article about TPACK (Technological Pedagogical Content Knowledge), a framework about learning to teach with technology. TPACK teaches teachers to plan content goals and activities and let technology be aid in meeting the learning goals as resources, not as sole teaching aids. In this particular article, the framework of TPACK is demonstrated through integration of curriculum. A sixth grade team taught a

Renaissance unit integrating the content into each core subject area: ELA, Math, Science, and Social Studies. The teachers' success with this unit was demonstrating technological pedagogoical knowledge through integration and scaffolding. "Shulman explained that pedagogical knowledge refers to the broad principles and strategies of classroom management and organization (2011)."

My sixth grade science class uses a web-based science curriculum that follows the 5E Model (Engage, Explore, Explain, Elaborate, and Evaluate) of teaching science is called Science Bits, each student has a Google Drive, and we also use a learning platform called Schoology. The structure of my classroom is as follows:

- Daily PowerPoints are created and provided in Schoology for students to follow along in class lessons and discussions. This is also useful for when students are absent, they have something to refer to to make up missed work. Power Points consists of slides that cover:
  - Do Now- instructions for students to follow upon entering the class.
  - Homework
  - Amazing Science Fact of the Day Brought to you by the Amazing Science Facts App
  - Essential Questions/Objectives of the day. In my school, we are required to create Content Objectives, Language Objectives, and Target Objectives.
  - Review from the day before
  - Vocabulary front load- activities using the SIOP model(Sheltered Instruction Observation Protocol). Such activities include using Kahoot.com or I Do, We Do, You Do method of introducing vocabulary.
  - Lesson of the day target points.

- ○ Classwork To Do list

- ○ Transition routine- Teacher calls out numbers that signify specific actions. 1.

    Stack and Pack; 2. Stand and push in chairs; 3. Line up on the cloudy side of the

    room (cloud bulletin board paper); 4. Leave classroom in a line.

- Each unit is uploaded to Schoology for students to refer to and retrieve resources.

- Science Bits contains daily activities of varying skills and content knowledge. Teacher

    uses content to create mini-lessons and group activities to differentiate instruction. The

    TPACK article exclaimed from Shulman, "Pedagogical content knowledge refers to how

    to teach particular content to make it understandable (2011)." Students work on

    reinforcement assignments to demonstrate understanding. Each student has his/her own

    personal account so assignments are submitted electronically.

- Student work environment: Each student has an assigned seat, however, once the

    mini-lesson is finished, the class has flexible seating options. There is a desk-bike, a

    carpet, counter space, and tall tables available to work at.

In conclusion, ways that my classroom demonstrates a TPACK framework is using the various

technology (Science Bits, Schoology, and Google) to support and enhance the curriculum

content; employing various Pedagogy such as SIOP, mini-lesson, and the 5E Model (incorporates

inquiry and project based-learning in the Elaborate section); Content Knowledge is provided

mostly by Science Bits, and enhanced by the teacher. Classroom management and rolling out

routines from the beginning using Responsive Classroom interactive modeling has helped set

expectations.

Finally, I would like to incorporate from in my professional development The Nature of

Science list I learned about during the Methods of STEM class.

- Scientific Knowledge is Based on Empirical Evidence

- Scientific Knowledge is Open to Revision in Light of New Evidence

- Science Models, Laws, Mechanisms, and Theories Explain Natural Phenomena

- Science is a Way of Knowing

- Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science is a Human Endeavor

- Science Addresses Questions about the Natural and Material World

I first learned of this list through the article by Lederman (2013) which explicitly lays out the seven aspects of the Nature of Science and gives an example from a classroom of how it is incorporated. I absolutely loved this article. The concept of science has never been more meaningful and well laid out for me. The NOS was used as the base when creating expectations for the NGSS, and it inspired me to use a more inquiry based model of teaching.

I will also provide the following resources:

- Things to do with NASA and STEM for grades 5-8

  https://www.nasa.gov/audience/foreducators/5-8/things-to-do.html
- Commercial Crew 2019 Artwork Calendar

  https://www.nasa.gov/feature/commercial-crew-2019-artwork-calendar

Who is your proposed audience (minimum 12)?

Science Teachers grades 1-8 and any other teachers interested.

What STEM concepts or learning goals will you and your materials address which can potentially replace other classroom activities?

I think this is addressed above in the integration section.

How and where do you intend to carry out your PD?

The professional development will take place at Las Américas ASPIRA Academy in my science class.

What, in general, will your pre-survey and post-survey ask?

1. How would you rate your online science program?

2. How long is your science block?

3. Do you feel comfortable teaching your science content?

4. Do you integrate science content in other subject areas?

5. Are you familiar with STEM or STEAM?

6. Do you feel comfortable incorporating STEM or STEAM content into your classroom?

7. How do you incorporate hands-on activities in your science curriculum?

8. Would you want to attend a professional development opportunity that focuses on incorporating hands-on science while using 1:1 devices?

What outcomes or expectation do you hope to see for your educators?

I hope my educators will feel inspired to incorporate more inquiry in the science lessons, create content goals and activities, and utilize the web-based science curriculum, amongst other technology, as tools for finding the answers to the content goals.

How will you follow up with the teachers in attendance?

Follow-up will occur with a post-survey through Google Forms.

What data collection methods (e.g. surveys, interviews) will you use to analyze the PD's success?

I would like to collect from the teachers' one lesson that includes:

   a. Content goals

      b.   Question/Inquiry

      c.   Activity

      d.   Tech-tool

      e.   Reflection

      f.   If possible, an artifact from the lesson.

References

Applied Educational Systems, Inc. (n.d.). What Are 21st Century Skills? Retrieved from

https://www.aeseducation.com/careercenter21/what-are-21st-century-skills

Bransford, J. D., Brown, A. L., & Cocking, R. R. (Eds.). (2000). How people learn: Brain, mind,

experience, and school. Washington, DC: National Academy Press.

Lederman, N.G., Lederman, J.S., & Antink, A. (2013). Nature of science and scientific inquiry

as contexts for the learning of science and achievement of scientific literacy. International

Journal of Education in Mathematics, Science and Technology, 1(3), 138-147.

Responsive Classroom. (n.d.). Retrieved from https://www.responsiveclassroom.org/

Sawyer, R. K. (2014). Introduction: The new science of learning.

SIOP - Learn about SIOP. (n.d.). Retrieved from http://www.cal.org/siop/about/

Wetzel, K., & Marshall, S. (2011, 12). TPACK Goes to Sixth Grade. *Journal of Digital Learning

in Teacher Education, 28*(2), 73-81. doi:10.1080/21532974.2011.10784683

Appendix A

Week 1 Discussion - Personal Reflection on the Value of Technology

Personal Reflection on the Value of Technology

The learning sciences represent a field that takes an interdisciplinary approach to learning and teaching. The intended goal is to formulate a better understanding of the social and cognitive processes that create the most effective learning environment. To that end, we must consider ways in which we can provide learning contexts such that our students have the opportunity to learn more effectively and more deeply.

Consider the following:

1. The traditional view of schooling in the 20th century was based on instructionism. This viewpoint held that teachers know facts and procedures and it was their role to transmit this knowledge to their students. The way that educators determined the success of schooling was to assess the students about how many of the procedures and facts they acquired. Instructionism prepared students for an industrialized economy present in the 1900's.

2. During the 1970's learning science was created to understand the way in which children learn. It was discovered that instructionism was inherently flawed (Sawyer, 2014). The teaching methods utilized did not address how students actually learn. A new concept of teaching emerged and was published by the United States National Research Council (Bransford, Brown & Cocking, 2000). The key components of the new cognitive science are:

a. Deep conceptual understanding – facts and procedures are not truly learned unless the student has the opportunity to apply knowledge to authentic situations.

b. Learning is not improved simply by revamping teaching. Students must actively participate in their own learning.

c. It is the job of the school to provide learning environments where students can apply facts and procedures to solve authentic problems.

d. Teachers must carefully consider all students' prior knowledge to make connections from what they know to what they are currently learning. Misconceptions must be addressed and corrected before new topics are introduced.

e. The role of student reflection on learning is crucial. Students must be given the opportunity to reflect on what they have learned and to express their knowledge and develop artifacts to exhibit learning.

Discussion Prompt: Our students are being prepared for a Knowledge Economy rather than an Industrial Economy. How will technology assist you as an educator to prepare your students for the knowledge workforce?