Hands on learning in a digital world...

“In our digitally interconnected world, it is possible to forget the importance of children touching and making things as a key element of enhancing their learning. Touching and making sparks their imaginations and excites them (about science and engineering).” Shirley Ann Jackson, Ph.D., President, Rensselaer Polytechnic Institute

Primary teachers have long recognized the value of hands-on, exploratory learning. More and more, educators are seeing the potential for play as a vehicle for engagement and deeper learning. Hands-on manipulative activities across disciplines — in particular STEM (Science, Technology, Engineering, Math) are beginning to be seen as essential for student success.

*Science is a process in which students need to be actively engaged… if they aren’t doing they aren’t learning. Consider the “ancient chinese proverb” (loose but popular translation):

I hear and I forget
I see and I remember
I do and I understand

And how it relates to the learning pyramid:

![Learning Pyramid](image)

**Hands-on learning** in science can be any educational experience that actively involves people in manipulating objects to gain knowledge or understanding. It is an activity based approach that involves prediction, exploration, explanation and evaluation. Students must hand and interact with materials – but this approach is more than just activity – **hands-on, minds-on learning** involves provoking curiousity and thinking (Lumpe & Oliver, 1991, p. 345).

This involves facilitation and question-finding, helping engage student interest, provoking questions, exploring explanations and finding further questions – Inquiry learning!

**The 3 Dimensions of Hands-on Learning** (Lumpe & Oliver, 1991):

1. The inquiry dimension – student uses activities to make discoveries
2. The structure dimension – the amount of guidance given
   a. Caution about the cookbook style – does not promote problem solving.
3. The experimental dimension - proving a discovery through experimentation.

*Reference: http://www.ncrel.org/sdrs/areas/issues/content/cntareas/science/sc500.htm

Through scientific inquiry, we can come to understand the world around us and the scientific processes at play. The **NSTA (National Science Teachers Association)** recommends that all students (in K – 16) have opportunities to participate in scientific inquiry. A combination of subject integration, fewer content specific learning outcomes and a focus on competencies and processes should support this.
When it comes to high tech hands-on learning to support problem solving, consider coding. With the explosion of kid and user friendly ‘coding apps’, Coding Clubs are appearing in local schools and many classroom teachers are exposing their students to code through ‘The Hour of Code’. [http://code.org/](http://code.org/)

View this article in Edutopia for more information and a list of 7 apps to teach children coding on coding [http://www.edutopia.org/blog/7-apps-teaching-children-coding-anna-adam](http://www.edutopia.org/blog/7-apps-teaching-children-coding-anna-adam)

### Something to ponder:

“Although the practice of planning and carrying out investigations has always been a part of good science instruction, the student focus often has been more on carrying out than on planning, with teacher-structured investigations far outnumbering student opportunities to develop their own research questions. Giving students opportunities to design and plan investigations allows them to truly experience the excitement of science and better understand the nature of scientific inquiry.” (Science Teacher, an NSTA publication) [http://nstacommunities.org/blog/2014/02/14/planning-and-carrying-out-investigations/](http://nstacommunities.org/blog/2014/02/14/planning-and-carrying-out-investigations/)

- How can you put the planning and development of investigations into the hands of your students?
- How can hands-on learning be supported across curriculum?
- Consider hands-on manipulative investigations and project-based learning to help elicit prior knowledge, spark interest and deepen learning!

### Squishy Circuits

Students can have fun with playdough to create their own simple machines and figures as they explore and discover the basics of electric circuitry. Consider an inquiry-based teaching approach (rather than providing the complete ‘instructions’ in advance to your students!). Use some guiding questions to prompt and extend learning. See Lynda’s blog: [http://excellenceinteachingscience.blogspot.ca/2014/08/fun-with-squishy-circuits-with.html](http://excellenceinteachingscience.blogspot.ca/2014/08/fun-with-squishy-circuits-with.html)

Recipe: [http://courseweb.stthomas.edu/apthomas/SquishyCircuits/conductiveDough.htm](http://courseweb.stthomas.edu/apthomas/SquishyCircuits/conductiveDough.htm)

Use an online forum (blog, Padlet wall, etc) to share ideas and questions as students work... or the teacher can circulate and record what he/she sees and hears (projecting the information on the wall as students work) [https://padlet.com](https://padlet.com)

### Sources of hands-on science activities:

- **Exploratorium** [http://exploratorium.edu/](http://exploratorium.edu/)
- **Discovery Education** [http://www.discoveryeducation.ca/Canada/](http://www.discoveryeducation.ca/Canada/)
  [http://siemensscienceday.discoveryeducation.com/index.cfm](http://siemensscienceday.discoveryeducation.com/index.cfm)

### Hands-on with Tech:

- **Maker space:**
  - The Tinkering Studio [http://tinkering.exploratorium.edu/](http://tinkering.exploratorium.edu/)

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**Sandbox Session - January 2015 @yvonnedtechtalk**