How we fail our learners and what we can do about it

By Peter Horszowski , issued by Pert Industrials   16 Jul 2018

Educational psychologists have identified four instinctive types of learning:

1. Quick Start – give me the minimum amount of info and let me start playing around.
2. Fact Finder – let me research this thoroughly *on my own* before I start.
3. Implementor – let me build a model and/or draw a diagram to get a handle on this.
4. Follow Thru – give me a good step-by-step programme and let me progress through it.

My dad falls straight into category 3. Whenever I ask him to explain something, he always reaches for a pen to draw a picture. My feeling is most engineering types fall into category 3, although quite a number will fall into category 1. But our schools are all designed for category 4. This is how we fail our learners.

It is a very serious problem – please have a look at Martha Beck's excellent article on this: https://marthabeck.com/2006/01/how-to-be-wildly-successful/.

She refers to the concept of "self–efficacy" when referring to her daughter's struggle at school. "I knew Katie was quickly losing something educational psychologists call her sense of *self-efficacy* [my italics] — her belief that she could succeed at specific tasks and life in general. People who lack this trait tend to stop trying because they expect to fail. Then, of course, they do fail, feel even worse, shut down even more, and carry on to catastrophe." Do you see how serious this is? We are not just losing good engineers and scientists. We are doing psychological damage to our kids.

Ok, here is what we propose. For the moment let's forget about CAPS and curriculum and pedagogy. Let's just take the politicians at their word and directly prepare our learners for their 21st-century challenges and the Fourth Industrial Revolution.

At PERT we've identified these critical new areas:

1. Water Purification
2. Green Energy
3. IoT (Internet of Things)
4. STEMI (Science, Technology, Engineering, Maths, Innovation)

Now, we haven't been terribly scientific about this. It is more a gut feel, surely biased by our own values and what we can offer. Still, what we can offer is effective and cheap. At the heart of it is an Arduino board which we are coupling with additional Snap Circuit componentry from our partners in the US.

This snaps all the learning boxes, so to speak. A *snap circuit* is actually a working model and diagram, so it is ideal for Implementors. Fact Finders can download to their heart's content from arduino.cc and elenco.com and PERT is developing the traditional sequential programme for the Follow Thrus. Which leaves the Quick Start. Like me. Check this out:

I built that on my kitchen table in 15 minutes – you can see my table in the video. It was really easy and lots of fun. (I am almost ashamed to admit how the little boy inside leapt up as the countdown began.) And remember I mentioned cheap? A system which includes the Snap project board, Arduino Uno and external componentry, all in educational casing, costs less than a textbook. (Plus the software is free – not long ago you'd need to add tens of thousands for C licensing.) Apologies if I sound like a cross between Winston Churchill and an infomercial but never before in human history has so much educational power been available for so little.

But not to be too jovial about this. The issue of self-efficacy is a very serious one in our rapidly changing world. Content-wise we feel pretty confident right now with this bundle. In addition to fundamental green energy activities and STEM projects, the board can control and monitor circuits (eg record and respond to light and wind levels) and this is the data sharing and automation at the heart of industry 4.0, a worldwide priority in technical education. But it is all changing so unbelievably fast. It is really hard to know what to teach these kids. We can sit here speculating and making predictions but the truth is we can hardly imagine what they will really need for life in the 2020s and beyond. Well, actually, we can. They will need enthusiasm and self-belief. *Self-efficacy*. Unfortunately, for so many potential engineers and scientists, our current educational system is designed to strip them of that.

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