A Methodology to Validate Educational Experiment Results in a Real Classroom Using ILOs

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ABSTRACT

Some influential researchers regard controlled experimentation as the best medium to test educational strategies and approaches. On the other hand, educators hold a view that controlled experimentation does not reflect a real classroom atmosphere, and consequently not all research findings replicate well in classrooms. This paper will present both points of view, by presenting supporting claims and studies. The paper will then presents an approach that can validate empirical claims in a real classroom setting. It tests against four metrics; a real classroom setting, long length materials, unlimited study time and against educational intended learning outcomes (ILOs). This paper then presents a case study that utilizes a Multimedia Learning Environment. The paper concludes by discussing some of the factors that may influence results. Results reinforce the claim that it is necessary to verify controlled experiments in real classroom settings.

Keywords: Computer Aided Instruction, Education, Educational Technology, Multimedia Learning Environment, Student Experiments

INTRODUCTION

Educational Research Findings Lose Their Way

Stanovich and Stanovich (2003) argue that educators must use controlled empirical experiment results in their classes. Justice (2006) indicates that there is a strong movement towards evidence-based practice in education and explains that a large amount of literature exists to inform educators about the intervention and prevention approaches to resolve the challenges faced by students with reading difficulties. In support of this argument, Hembenstall (2006) says that teaching is suffering because it does not sufficiently include results of empirical experiment results into educational pedagogies. This view is also supported by Carnine (2000) who notes that education continues to be impervious to research on effective practices after comparing it to fields like medicine. Sabelli and Dede (2000) have noted that decades of funding into technology-enhanced learning researcher did not result in effective improvements in classroom practice.
Stanovich and Stanovich (2003) explain that teachers’ educational know-how comes from three main sources of information. The first is peer reviewed published papers that withstood the scrutiny of peers and survived a filter of reviewers to be published. The second is un-refereed publications where educators exchange information about the best educational approaches they gained through instinct or expertise. The third is when a number of different sources of information deliver the same message as when a published experiment is replicated.

Justice and Fey (2004) express a similar view when researching students with reading difficulties. They explain that assessments and interventions in schools should be based upon an integration of several factors. The first as with Stanovich and Stanovich (2003) is systemic empirical research. The second is described by Stanovich and Stanovich (2003) as un-refereed publications and described here are substantive theoretical knowledge. They also add clinical expertise and child and family preferences, which is specific to their field of implementation.

Therefore, educators have a multitude of sources from which to extract viable educational techniques. Stanovich and Stanovich (2003) encourages teachers to follow a “what works” epistemology to update their teaching approach. In other words, it is the duty of researchers to produce the results of controlled studies and it is the duty of educators to understand these contributions and implement into uncontrolled classroom environments and expect the same results to materialize. The epistemology lays the burden on the educator to test these results and face the possibility of failure while performing their teaching duties.

ISSUES IN THE ROBUSTNESS OF THE EXPERIMENTS

In investigating why educators are resistant to test empirical research findings in their classrooms, some researchers believe the problem is with educators. For example, Carnine (1995) explains that educators do not have all the skills required to seek out and evaluate research that can be implemented in classrooms. Chu (2005) analyses research findings for educators in order to give them a mapping of when to use each technique based upon cognitive science research.

On the other hand, some researchers believe the cause of the problem to be in the design of experiments. Ansari and Coch (2006) believe that knowledge obtained from neuroscience research is not clear enough to be implemented readily to influence educational practice. Bransford et al. (2000) indicate that researchers will design better experiments if they are aware of the real world questions that arise in a real classroom.

A meta analysis by Cheung and Slavin (2011) who reviewed 74 different research papers that examined a total of 56,886 students only to find a combined positive influence factor of +0.16 in facilitating math learning in K-12 schools. They also examined variability for research controls to find a significance of p < 0.05 probability. This highlights the amount of difference in the levels of controls imposed upon experiments and how confused researchers are in the prioritization of these controls. Several different studies support the view that researchers are indeed confused with selecting the controls that would make their experiments robust enough to be replicated in a real classroom including Barab and Leuhamm (2003) and later Roschelle et al. (2008).

These deep-rooted differences in research methodology are perhaps what caused Morrison (2010) to claim that educators face problems in deciding “what works” in a classroom. Morrison (2010) also states that faith is the results of empirical testing is shaken basing his argument on Chaos Theory. Under this theory as explained by Tymms (1996), the outcomes of the same teaching approach may have different results even if the same curriculum is taught in the same classroom taught by the same teacher. He concludes that an educator finds it very hard to hold variables constant in a dynamical evolving fluid and unique situation.
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