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Definition of Instructional Technology and ITEC Research

Instructional technology is the discipline concerned with both the theory and the practice of designing, developing, presenting, and evaluating instructional activities so as to facilitate efficient and effective learning. Based on its focus on the specifics of instruction and learning, instructional technology is generally regarded as a subset of the wider field of educational technology (Ely, 2004). The field focuses on tasks relating to the two main types of instruction: that which informs the learner and that which helps the learner perform tasks (Clark & Mayer, 2008; Lohr, 2008), and seeks to apply principles of cognitive science and learner behavior to the processes of designing and delivering instruction via various communications media.

Dr. Logos' criticism of the current research in the field is a valid one; a more strict adherence to the scientific method of research will drive instructional technology advances much more than does most of the current literature, and will also serve to bolster acceptance of the field as one based in science (Merrill, Drake, Lacy, & Pratt, 1996). To be relevant and useful to practitioners and researchers alike, studies in the field of instructional technology should be well-designed, quantitative-based experimental studies rather than informal studies; while many studies of education-related topics focus on qualitative data, the subjectiveness of such data makes it difficult to extend hypotheses to larger populations, and significant research demands more rigor than is usually found in the qualitative responses to informal studies. As much as possible, studies should be tool-agnostic; research undertaken to test theory-based hypotheses is likely to lead to findings that will inform future practice in the field by being generalizable to larger populations and to specific technologies available for delivering instruction. Since the

applicability of a study's findings to the field at large is dependent upon how closely the subjects in the sample represent the larger population for which the researcher wants to draw inferences, utilizing sample subjects who are college-aged or older will likely yield results that are most applicable for my research interest of adult and workplace learning (Clark & Mayer, 2008).

Given that instruction and learning are highly personalized experiences, with both multiple and unique biases inherent within subjects, it can be difficult to single out the effect of the independent variable on the outcome of the treatment. However, this challenge can be overcome through a controlled study of an appropriately-large sample size, with subjects randomly assigned to a treatment group. To most effectively generalize findings to larger populations, data analysis should reveal both practical and statistical significance (Clark & Mayer, 2008), with $p<0.05$ and effect size of 0.5 or greater, and the results should merit an in-depth discussion rather than a short presentation. Finally, another important criterion to consider when evaluating the relevance of research is the extent to which its questions and theories have been replicated in similar studies; the existence of multiple studies of the same types of treatments and procedures increases the credibility of the research.

A 2009 study by Lin and Dwyer of the effect of different types of visuals in a computer-based instruction (CBI) environment fits many of the criteria mentioned above. The authors sought to determine "the effectiveness of three different levels of enhancement strategies utilized to facilitate students' learning from static and animated visualization" (p. 155), posing four research questions "to fill in gaps and extend prior studies" (p. 160). Drawing on similar prior research, Lin and Dwyer used two pilot studies to determine the optimal placement of animated visuals within the proposed instructional design based on the difficulty of four criterion measures to be administered as post-tests. The authors then designed their experiment around a 2000-word

physiology lesson, which was delivered via CBI. Of particular importance for the study's validity was the review of its treatments by a panel of experts, including visual design experts, current doctoral students in biology, and subject matter experts who had previously taught the lesson in a face-to-face environment (p. 166).

The study's 2x3 factorial experimental design was based on two independent variables: type of visual (static versus animated), and instructional enhancement provided within the lesson (no enhancement, question-only enhancement, and question plus feedback enhancement) (pp. 161-163). The CBI lesson was administered to 582 undergraduate students enrolled in a "number of classes" (p. 161) at a large research university, with students randomly assigned to one of the six treatment groups. This experimental design controls for potential biases through the random assignment and helps to ensure greater validity of the results.

Perhaps the most impressive feature in terms of assessing its worth is the study's discussion of the results and potential shortcomings of the findings. Lin and Dwyer provided an in-depth explanation of the results both between and among variables and across the four criterion measures, finding that the main effects of type of visual and type of enhancement received were statistically significant, both at a level of $p<0.001$, with mixed significance when considered against the dependent variables. The overall results supported three of the research hypotheses and did not support the fourth; while providing potential explanations for not supporting all of the hypotheses, the authors are careful to examine multiple aspects of the study for which a redesign might be valuable to retest the hypotheses. Closing their report, the authors provide suggestions for the design and treatment strategies of future research in the field.

Overall, the study meets most of the criteria mentioned above, and is sufficiently detailed in its presentation to provide direction for both its repeatability and the manner in which results

can be interpreted. The authors' thoughtfully-posed hypotheses and fully-detailed conclusions make it a good example of research that expands the knowledge base of our field while identifying opportunities to carry this line of theory even further.

References

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