

PREFACE

Special Issue on Adaptive Learning

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In recent years, adaptive learning has become one of the major topics in both research and practice in Technology, Instruction, Cognition and Learning (TICL). The goal of this special issue is to promote a deeper understanding of theoretical issues that inform the design of adaptive learning systems. Specifically, papers included in this special issue are based on symposium talks given at a TICL SIG symposium on adaptive learning at the American Education Research Association (AERA) Conference in San Antonio in 2017 followed by Scandura's Keynote address to the TICL SIG.

In the first paper, Robert (Bob) Sottolare (e.g., 2012) described the goals of the ambitious Generalized Intelligent Framework for Tutoring (GIFT) framework for adaptive learning supported by the US Army. His article provides a comprehensive review of emerging solutions for adaptive instructional systems comprised of the following three elements: learners, Intelligent Tutoring Systems (ITSs) and external (non-adaptive) instructional environments.

Joseph M. (Joe) Scandura's talk had been published almost simultaneously in TICL in a co-authored effort describing the AuthorIT authoring and TutorIT tutoring platforms (Scandura & Novak, 2017). Joe's first paper in this issue includes a short summary along with a listing of AuthorIT/TutorIT technologies that address GIFT goals. It concludes with their relationships to work summarized by John (Dexter) Fletcher in this special issue.

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John (Dexter) Fletcher starts his paper with a historical introduction to computer-based instruction, including interesting work he did years ago with Pat Suppes sharing some features with Scandura (Suppes & Groen, 1967; Fletcher, & Zanotti, 1976). He then goes on to detail an eclectic DARPA effort to build an effective system designed to duplicate human tutoring.

The keynote paper by Scandura which followed traces the long history of basic and applied research and theoretical developments leading to the Structural Learning Theory (SLT), along with how and why it developed as it did. As will become clear to the careful reader, SLT is as much or more a rigorous theory of teaching and learning rather than just a learning theory alone. Among other things, Scandura's article traces key issues faced in development of the SLT along with solutions to those issues. Most importantly, it shows how key developments in the SLT enabled development of the AuthorIT authoring and TutorIT tutoring technologies, including how and why it has enabled rapid development of so many highly efficient adaptive learning tutorials on a highly restricted budget.

Three talented individuals have each presented a distinct point of view. One question is whether they are all distinct. Or, whether they share common threads that can lead to more rapid development and greater success in practice. A few initial comments:

A major goal of GIFT is to make the authoring process more efficient. It also imposes a specific framework with a set of constraints as to how tutoring systems are to be developed. How can one be sure that those constraints do not stand in the way of authoring efficiency? A similar comment applies to the DARPA work cited by Fletcher: Repeat an expensive develop-test-refine cycle until satisfied.

Scandura's first paper summarizes the current status of AuthorIT and TutorIT, historical developments leading to the Structural Learning Theory (SLT) and how the former accommodates goals of the GIFT framework as well as work summarized by Fletcher. It also distinguishes foundational assumptions on which SLT, TutorIT and AuthorIT rest – in short, a theoretical framework that is deterministic in nature rather than stochastic.

Scandura's keynote details how and why SLT developed as it did as well as which parts have and have not yet been implemented in the AuthorIT and TutorIT technologies themselves. Based on a fundamentally different theoretical foundation, this work not surprisingly represents a major departure from other work in adaptive learning. To date, however, controlled empirical evaluation has been limited to SLT per se. Despite positive results with AuthorIT and TutorIT in informal trials, well designed empirical research is clearly needed.

One way to evaluate these approaches would be to create a set of neutral criteria and see how each stacks up. Core criteria should include efficiency of authoring processes, effectiveness of the delivery and empirical results. Perhaps even more important, how can the benefits inherent in any one of the approaches be used to benefit in others. To promote progress, we seek to both broaden and deepen the discussion and debate. All are invited to contribute well thought out ideas, analyses and proposals. Symposium discussants, Mike Spector and Scott Warren, along with those who could not make it to San Antonio are invited to participate.

Submit your ideas and join the discussion! Articles in recent issues of TICL both complement and challenge work in the field and propose new challenges. Proposals to independently test one or another of the approaches empirically are especially welcomed. To begin the discussion, we welcome informed comments on articles in this issue for publication in future issues.

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