Toward a Unified Perspective on Assessment Models: Bridging a Fragmented Gap

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In the dynamic landscape of educational and psychological assessment, the proliferation of models with distinct theoretical roots has often led to fragmentation in both research and practice. In their recent article, "Toward a Unified Perspective on Assessment Models, Part II: Dichotomous Latent Variables," Associate Professor of Educational Leadership and Research Methodology, Sangbeak Ye, Ph.D., along with international collaborators, offer a comprehensive framework that unifies influential traditions in psychometrics and mathematical psychology. For decades, three main frameworks, i.e., Item Response Theory (IRT), Cognitive Diagnosis Models (CDM), and Knowledge Space Theory (KST) have guided educational assessment. While each has its own strengths, they have largely developed in isolation, with different terminology and mathematical foundations.

Building on Part I of this three-part work, the team demonstrates that assessment models can be derived from a common set of mathematical 'primitives' and operations. For example, the framework reveals that early CDM and KST models are essentially different applications of the same underlying theory, while modern CDMs are discrete versions of IRT models, differing mainly in how they reparametrize probabilities. By focusing on 'structure' (the relationships among skills, items, or attributes) and 'process' (the probabilistic links between them), the KST and CDMs can be unified under a single taxonomy.

This contribution provides a strong foundation for further generalizations, including models that handle polytomous or continuous skills and responses, which will be addressed in the team's forthcoming work. Their framework also lays the groundwork for addressing persistent challenges in assessment, such as model identifiability and the integration of cognitive theory with statistical modeling. Importantly, the incorporation of psychometrics in education and statistics has wide-reaching applications in both academia and industry.

For researchers and practitioners, this unified perspective offers a powerful lens for understanding, comparing, and innovating assessment models, ultimately advancing the rigor and utility of measurement. By understanding the assumptions and structures behind each model, such as independence of skills or items, or the choice of link functions, educators can better interpret assessment results and tailor interventions.

Ye's expertise in developing assessments and methodologies is grounded in psychometric modeling, particularly IRT, CDM, and KST. This expertise allows him to offer interdisciplinary collaboration and student research opportunities to the Florida Atlantic community.

Faculty and students who are interested in exploring collaborative research projects and opportunities are encouraged to contact Dr. Sangbeak Ye at sye@fau.edu.