# On an generalization of local independence in item response theory based on knowledge space theory

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**Abstract**
Knowledge Space Theory (KST) structures are introduced within Item Response Theory (IRT) as a possible way to model local dependence (LD) between items. The aim is threefold: Firstly, to generalize the usual characterization of local independence without introducing new parameters; secondly, to merge the information provided by the IRT and KST perspectives; and thirdly, to contribute to the literature that bridges continuous and discrete theories of assessment. In detail, connections are established between the KST Simple Learning Model (SLM) and the IRT General Graded Response Model (GRM), and between the KST Basic Local Independence model (BLIM) and IRT models in general. As a consequence, local independence is generalized to account for the existence of prerequisite relations between the items, IRT models become a subset of KST models, IRT likelihood functions can be generalized to broader families, and the issues of local dependence and dimensionality are partially disentangled. Models are discussed for both dichotomous and polytomous items and considerations are drawn on their interpretation (e.g., relevance of the parameters, definition of polytomous items as knowledge structures of dichotomous ones, interpretation of Rasch model as a probabilistic version of Guttman's scale).

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