Q-matrix is a

- "*method, which examines the inputs of many students to automatically extract relationships between questions and underlying concepts, and then uses those relationships in diagnosing and correcting student misconceptions.*"
- domain-independent knowledge model
- originally a binary matrix showing the relationship between test items and latent or underlying attributes, or concepts
- To build the q-matrix, experts constructed a relationship between test questions and concepts (referred to as attributes) and students taking the test were assigned knowledge states based on their test answers and the constructed q-matrix [1)]

	Questions				
	1	2	3	4	5
Concept 1	0	0	1	1	1
Concept 2	1	1	1	1	0

The goal of q-matrix construction is to extract underlying, or latent, variables, which account for studentsí differential performance on questions.

Approaches:

- Hand construction of the q-matrix by experts' assigning concepts to questions and then comparing student answers to closest matrix responses. Problems: a q-matrix is a much more abstract measure of the relationships of questions to concepts. We might assume that the questions designed to test students are a more accurate reflection of the teaching objectives than an abstract construct which relates questions to underlying concepts.
- The alternative to this strategy is to design a method to extract a q-matrix, which explains student behavior, and reveals the underlying relationships between questions. Experts can examine the resulting q-matrix 25 to ensure that the extracted relationships seem to be valid, and then use that q-matrix to guide the generation of new problems.

Factor analysis: How to automatically determine concepts? Using covariance matrix. Number of concepts should be smaller than number of questions. Still, this methos has proven to be less fault tollerant.

1)

see Ham85 for a discussion of item-response theory