Scale Development and Validation

The attitudes measures were developed by adapting the *Colorado Learning Science Survey for Use in Chemistry* (CLASS-Chem), the *Chemistry Self-Concept Inventory* (CSCI), a science identity survey, a fascination survey, and a math anxiety survey. However, we use factor analysis and Item Response Theory analyses to ensure that the resulting scales had strong psychometric properties (i.e., they loaded as a single factor, they measured students well across ability levels, and they had high reliability).

Chemistry Fascination

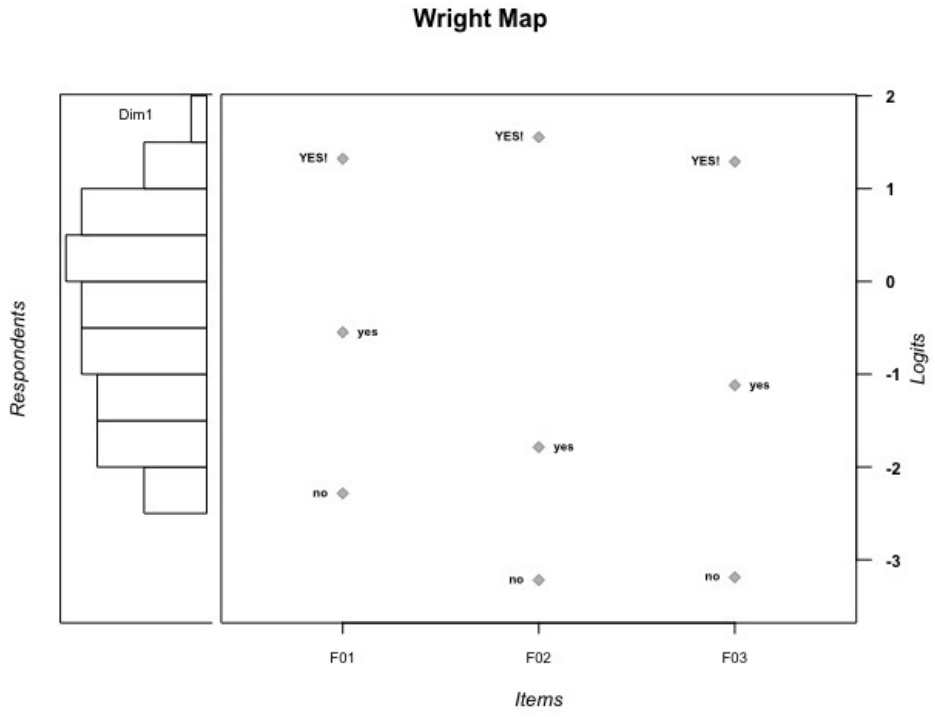
Table S1.Means, alpha if deleted, EFA loadings and inter-item correlation information for the Chemistry Fascination Scale.

Item	*Variable*	*Missing*	*Mean*	*SD*	*α if deleted*	*EFA*
F01	I wonder about the role of chemistry in nature	0.48 %	2.75	0.87	0.79	0.61
F02	In general I find chemistry topics	0.41 %	3	0.67	0.64	0.82
F03	I want to know everything I can about chemistry	0.27 %	2.93	0.76	0.65	0.81

Mean inter-item-correlation=0.55 · Cronbach's α=0.78

The Chemistry Fascination survey was composed of three items, and all items had missing responses below 5%. The overall alpha was good and EFA loadings suggest a one-dimension scale (Table S1). Item-Response Theory (IRT) analyses were used to make sure items had varying "difficulty" levels (i.e., measured participants well across ability levels). Figure S1 shows the Wright Map for this scale. The Wright Map shows item difficulties plotted against the histogram of student ability levels to show that the items and the Likert scale measured students across different levels.

Figure S1. Wright Map for Chemistry Fascination Scale



Chemistry Competency Beliefs

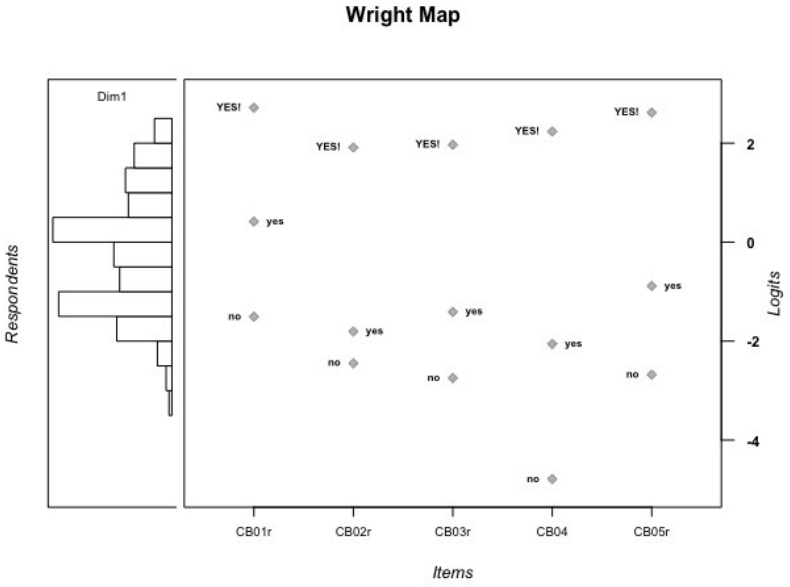
Table S2.Means, alpha if deleted, EFA loadings and inter-item correlation information for the Chemistry Competency Beliefs Scale.

Item	*Variable*	*Missing*	*Mean*	*SD*	*α if deleted*	*EFA*
CB01	Chemistry intimidates me.	0.68 %	2.28	0.8	0.80	0.77
CB02	I have trouble understanding anything based on chemistry.	0.61 %	2.91	0.7	0.79	0.87
CB03	I have always had difficulty understanding arguments that require chemical knowledge	0.82 %	2.85	0.7	0.79	0.84
CB04	I can usually figure out a way to solve chemistry problems.	1.09 %	2.97	0.5	0.84	0.57
CB05	After I study a topic in chemistry and feel that I understand it, I have difficulty solving problems on the same topic.	0.68 %	2.69	0.7	0.84	0.57

Mean inter-item-correlation=0.53 · Cronbach's α=0.85

The Chemistry Competency Beliefs Survey was composed of five items, and all items had missing responses below 5%. The overall alpha shows strong reliability and EFA loadings suggest a one-dimension scale (Table S2). Figure S3 shows the Wright Map for this scale where the item responses are distributed along the score distribution.

Figure S 2. Wright Map for Chemistry Competency Beliefs Scale



Math Competency Beliefs

Table S3.Means, alpha if deleted, EFA loadings and inter-item correlation information for the Math Competency Beliefs Scale.

Item	*Variable*	*Missing*	*Mean*	*SD*	*α if deleted*	*EFA*
MathA01	I am quite good at introductory Calculus	1.84 %	3.19	0.7	0.85	0.58
MathA02	I have trouble understanding anything based on math	0.55 %	2.76	1.0	0.76	0.84
MathA03	I never do well on science test questions that require math reasoning	0.55 %	2.67	0.9	0.78	0.80
MathA04	Math makes me feel inadequate	0.48 %	2.75	1.0	0.75	0.82

Mean inter-item-correlation=0.56 · Cronbach's α=0.84

The Math Competency Beliefs Survey was composed of four items, and all items had missing responses below 5%. The overall alpha shows strong reliability and EFA loadings suggest a one-dimension scale (Table S3). Figure S3 shows the Wright Map for this scale where the item responses are distributed along the score distribution.

Figure S 3. Wright Map for Math Competency Beliefs Scale