Using Idea Maps to Interpret Students' Scaled Scores

The idea map is a way of visually depicting the difficulty of the test questions. The numbers on the left are the scaled scores. The boxes on the right outline the range of scaled scores for the questions assessing the idea described in the box. Boxes toward the bottom of the map are easier and boxes toward the top of the map are more difficult. These maps can be used to determine what ideas students have likely mastered. A user can locate a student's scaled score on the left and then draw a line to the right to see what boxes correspond to that score. When the student's score matches the idea's score, the student has a 50% chance of responding correctly to the questions testing that idea. When the student's score is higher than the box, the student has a greater than 50% chance of responding correctly. When a student's score is lower than the box, the student has a less than 50% chance of responding correctly. For example, Figure 1 shows a sample map for the questions aligned to elastic potential energy. A score of 490 cuts through the lower edges of the top two boxes. This indicates that this student has likely mastered the ideas below 490 (the more an object is stretched the farther it will go when released and elastic potential energy depends on how much an object is stretched). Because 490 cuts through the bottom of the top boxes, it is likely that this student is just starting to develop the idea related to the difficulty to stretch and the idea about the changes in the distances between atoms and molecules.

Scaled Rasch Measure	565 560 555 545 545 545 545 545 545 545 545 545 545 545 545 545 545 545 545 545 540 535 545 540 545 500 490 485 470 465 440 435 420 415	The elastic potential energy of	The amount of elastic potential	
		depends on how difficult it is to stretch or compress the object.	energy increases when an object is stretched or compressed because stretching and compressing an object changes the distances between the atoms and molecules that make up the object.	
		The amount of elastic potential energy an elastic object has depends on how much the object is stretched or compressed.		
		The more an elastic object is stretched or compressed the farther it can propel itself or another object when released.		

Figure 1: Map	of ideas related	to elastic	potential	energy
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Figure 2 shows a sample map for the questions aligned to conduction. A score of 490 on this map cuts through the box representing the intermediate level of conduction. This indicates that this student has likely mastered the ideas below 490 (the more phenomenological basic level understanding of conduction) and is developing the intermediate level idea. However, this student has not begun to understand the advanced level represented by the box on the far right. On this map, the small box at 505 represents a basic level question that was more difficult than the other basic level questions. This question involved placing cold butter on very hot corn. Some students think that objects at the extreme ends of the temperature range tend to change the temperature of objects with which they are in contact but don't change temperature themselves. This misconception was embedded in the test question as a distractor which made this question more difficult that the other questions that did not include this misconception.

Scaled Rasch Measure 292 222 Measure 292 222 222 222 222 202 228 222 222 222 202 228 222 222 222 202 228 222 222 222 202 222 222 222 202 222 222	See note below When two things touch, the warmer things get cooler and the cooler things get	Conduction is the transfer of energy that occurs when a warmer object (or sample of matter) comes in contact with a cooler object (or sample of matter) without a transfer of matter.	Energy is transferred by conduction through a material by the random collisions of atoms and molecules that make up the material.
460 455 450 445 440 435 430 425 420 415	the same temperature.		
NOTE: objec warm	One question at 505 tests th ct comes in contact with a co ner <u>and</u> the hot object will ge distractor that said that the ve	ne basic level idea th ooler object, the coole t cooler. Many stude ery hot object will no	at when a very hot er object will get nts selected the t get cooler.

Figure 2: Map of ideas related to conduction