

## Enquiry-Based Learning: Experiences of First Year Chemistry Students Learning Spectroscopy

Timothy Lucas and Natalie M. Rowley

### Supplementary material

#### Clarification of data relating to shifts in students perceived confidence

An example illustrates the method employed.

For the question which indicates student self-evaluation of their understanding of how mass spectrometry works, the data (as frequencies) are:

N = 42		<i>Strongly agree</i>	<i>Agree</i>	<i>Neutral</i>	<i>Agree</i>	<i>Strongly agree</i>	
<i>Pre-EBL</i>	<i>I understand how mass spectrometry works</i>	14	21	5	1	1	<i>I do not understand how mass spectrometry works</i>
<i>Post-EBL</i>		21	20	1	0	0	

The data in the “Pre- and Post-EBL Sessions” column of Table 1 represent the *total number* of students who responded in each of the categories.

In light of the fact that we couldn't use a statistical analysis (due to the small size of the data set), we devised an approach to look at shifts in an *individual student's* responses between the pre-EBL and post-EBL surveys. It is from this analysis that the “changes in confidence” data are derived.

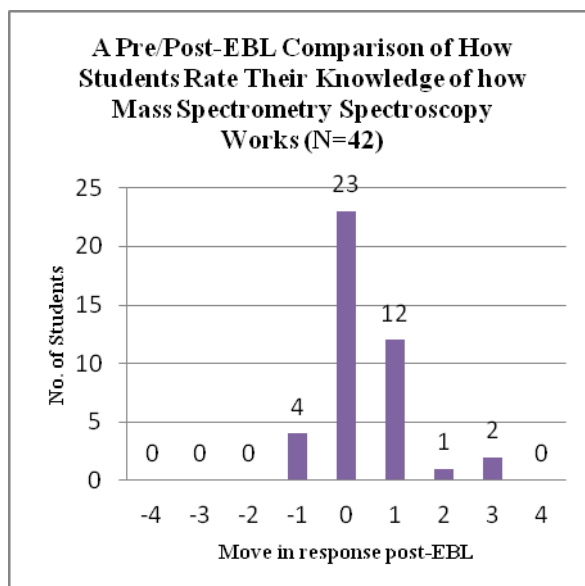
For this method, the following were used:

Response	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Value	-2	-1	0	1	2
Category	Negative		Neutral	Positive	

When a pre-and post-intervention data set is available, the *difference* between a student's responses can be evaluated on a rating scale using this method

Moves (+/-)	Information provided
0	A move of zero shows that an individual is responding identically in both data sets.
1	In most cases, moves of +/- 1 do not provide any specific information on individuals' responses, but a trend may be observed (i.e. if there are a lot of responses in this category). In most cases there are a number of +/- 1 shifts.
2	A move of 2 represents a distinct change of category on the rating scale (i.e. from a negative response to a neutral or positive response, or vice versa).
3	A move of 3 illustrates a major shift in response. Two possible examples are a change from a "Disagree" to a "Strongly Agree" or from a "Strongly Disagree" to an "Agree" response.
4	A move of 4 is the most extreme shift, being from one end of the scale to the other ("Strongly Agree" to "Strongly Disagree" or vice versa).

The mass spectrometry data in the "changes in confidence" part of the table comes from an analysis of individual student's responses:



If a student's perceived confidence was the same pre- and post-EBL they were assigned as "0". 23 students of the 42 gave the same response pre- and post-EBL which gives 55%.

If a student indicated a higher level of confidence post-EBL *i.e.* a shift in response in the direction of "agree" to "strongly agree" to the statement of "I understand how mass spectrometry works", then this was a positive shift (between 1 and 4). It can be seen that a total of 15 students indicated a positive shift, hence 36%.

If a student indicated a lower level of confidence post-EBL *i.e.* a shift in response in the direction of "agree" to "strongly agree" to the statement of "I do not understand how mass spectrometry works", then this was a negative shift (between -1 and -4). It can be seen that a total of 4 students indicated a negative shift, hence 9%.