

USCOTS 2009 - Breakout Session #3

LETTING GO OF ASSUMPTIONS ABOUT HOW STUDENTS UNDERSTAND STATISTICAL LANGUAGE

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Abstract: This session will begin with an introduction of the concept of Lexical Ambiguity including relevant research and its importance to the study of statistics education. The session participants will then use think-pair-share in increasingly larger groups to identify statistical terms that tend to be misunderstood by their students and to have the characteristics of lexical ambiguity. This activity will focus on identification of misconceptions about these words and ways to assess them. The researchers will then share the results of the research about 5 particular words that they have been studying for the last year. The session will end with a discussion of how to address some of the misconceptions and misuses through instruction and how to build statistical understanding of terms that have different meanings outside of the statistics class.

Other Publications and Presentations from this research:

Kaplan, J.J., Fisher, D., and Rogness, N. (in progress, 2009) Lexical Ambiguity in Statistics: What do students learn about the words: association, average, confidence, random and spread? *Journal of Statistics Education*

Kaplan, J.J., Fisher, D., and Rogness, N. (in review, 2008). Lexical Ambiguity in Statistics: What Do students know about the words: association, average, confidence, random and spread? *Journal of Statistics Education*.

Kaplan, J., Fisher, D, and Rogness, N. What Do Students Hear When We Say 'Random'?:
Empirical Results from a Study of Lexical Ambiguity. To be presented at Joint Statistical Meetings, Washington D.C., August 4, 2009.

Hilton, S., Kaplan, J., Hooks, T., Harrell, L., Fisher, D. & Sorto, M.A. (2008) Collaborative projects In statistics education. *JSM Proceedings*, Statistics Education Section. Alexandria, VA: American Statistical Association.

References:

Durkin, K. & Shire, B. (1991a). Lexical ambiguity in mathematical contexts. In K. Durkin & B. Shire (Eds.) *Language in Mathematical Education: Research and Practice*. Philadelphia, PA: Open University Press, 71 – 84.

Lemke, J. (1990). *Talking Science: Language, Learning and Values*. Norwood, NJ: Ablex Publishing Corporation.

Leung, C. (2005). Mathematical vocabulary: Fixers of knowledge or points of exploration. *Language and Education*, 19(2), pp. 127 – 135.

Shultz, T. & Pilon, R. (1973). Development of the Ability to Detect Linguistic Ambiguity. *Child Development*, 44, pp. 728 – 733.

Thompson, D. & Rubenstein, R. (2000). Learning mathematics vocabulary: Potential pitfalls and instructional strategies. *Mathematics Teacher*. pp. 568 – 574.

Research Results on backside

Students Statistical Definitions of AVERAGE			Number of Subjects	
			Pilot Study	Validation Sample
Measures of Center	Mean	Word only	11 (22%)	26 (35%)
		statistical: incomplete or inaccurate	5 (10%)	11 (15%)
		statistical: complete and accurate	9 (18%)	17 (23%)
	Median	word only	1 (2%)	1 (1%)
		colloquial: in the middle, normal, standard	3 (6%)	6 (8%)
		statistically correct	0	0
	Mode	word only	0	0
		colloquial: majority, most common	5 (10%)	5 (7%)
		statistically correct	1 (2%)	0
Other Definitions	Sum		4 (8%)	2 (3%)
	Frequency		1 (2%)	0
	Approximation		2 (4%)	0
	Representative Number		2 (4%)	1 (1%)
	Number used in inference		1 (2%)	0
	Range of numbers		0	0
Not Classified			4 (8%)	6 (8%)

Students Statistical Definitions of ASSOCIATION	Number of Subjects	
	Pilot Study	Validation Sample
Incorrect statements: not about relationships or comparing	10 (21%)	3 (5%)
Having something in common	3 (6%)	10 (16%)
Numerical comparisons	10 (21%)	9 (14%)
Indeterminate relationships or linkages	15 (31%)	23 (37%)
Relationships between variables	9 (19%)	16 (25%)
Not classified	1 (2%)	2 (3%)

Students Statistical Definitions of SPREAD	Number of Subjects	
	Pilot Study	Validation Sample
A spread sheet (with data)	14 (30%)	8 (11%)
Range	5 (11%)	20 (27%)
Data (in a spread sheet or list)	14 (30%)	1 (1%)
To space numbers apart	1 (2%)	2 (3%)
Scattered numbers	2 (4%)	2 (3%)
A non-specific measure or calculation	2 (4%)	0
Equal distribution	1 (2%)	4 (5%)
Distribution of numbers	1 (2%)	12 (16%)
Measure of Variability	0	11 (15%)
Non-specific information from figure or graph	2 (4%)	5 (7%)
Not Classified	5 (11%)	9 (12%)

