SCHOOL MATHEMATICS STUDENTS' REASONING ABOUT VARIABILITY IN SCATTERPLOTS

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Research on students' reasoning about scatter plots has mostly concentrated on the reading, translating, and representing processes (Moritz, 2004). Our research placed students in the position of raising their own questions and conjectures about the types of variability they notice in a scatterplot, with subsequent probes for possible causes of that variability.

Research Questions

- Will students reason just about particular points, or employ data reduction strategies and reason about clumps in describing variability?
- How will students explain the variability within and across categories of variables?
- Will students reason from absolute numerical values, or will they address the proportions or percentages, thus combining information from several variables?

Discussion

Less than half of the students (36%) were able to articulate the relationship between the two variables and to use of that information to reason about the scatterplot. Relating the two variables requires an understanding of proportions, and the ability to focus on both axes when reading scatterplots.

Conclusion

The students' responses demonstrated a wide spectrum of possible thinking about bivariate information. Students made predictions and comparisons: I) Focusing only on outliers or particular values; II) Appealing to clumps or clusters of the data; III) Creating their own hypothetical cut-off lines; IV) Reasoning only from frequencies (purely additive reasoning); V) Transforming the initial data by using proportions or percentages (proportional reasoning); VI) Explicitly referring to both centers and spreads when making comparisons across the restaurants (distributional reasoning). The rich spectrum of responses to this task suggests that students pass through a variety of levels of thinking about bivariate graphical information. Students' responses to such tasks can provide researchers with solid clues about the developmental paths of student thinking about graphs, and can give teachers an opportunity to tap student responses to promote classroom discourse and shared thinking.

References

Moritz, J. B. (2004). Reasoning about co-variation. In J. Garfield & D. Ben-Zvi (Eds.), *The challenge of developing statistical literacy, reasoning and thinking* (pp. 227-256). Dordrecht, The Netherlands: Kluwer.

Shaughnessy, J. M., Ciancetta, M., & Canada, D. (2004a). Types of student reasoning on sampling tasks. In M. Johnsen Høines & A. Berit Fuglestad (Eds.), *Proceedings of the 28th meeting of the International Group for Psychology and Mathematics Education* (Vol. 4, pp. 177-184). Bergen, Norway: Bergen University College Press.

Alatorre, S., Cortina, J.L., Sáiz, M., and Méndez, A.(Eds) (2006). Proceedings of the 28th annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education. Mérida, México: Universidad Pedagógica Nacional.