

Comparing the Mathematical Knowledge for Teaching Geometry of Preservice and Inservice Secondary Teachers

Inah Ko
University of Michigan

Mike Ion
University of Michigan

Patricio Herbst
University of Michigan

Keywords: Mathematical knowledge for teaching, Measurement invariance, Pre-service teachers, Teaching geometry

In this poster presentation, we share what our research team has learned by collecting responses from Geometry for Teachers (GeT) students who have taken a mathematical knowledge for teaching geometry (MKT-G) assessment before and after taking the GeT course. By following the definitions of mathematical knowledge for teaching from Ball, Thames, and Phelps (2008), Herbst and colleagues developed an instrument to measure MKT-G called for in the mathematical work involved in tasks of teaching nested in different instructional situations. We used a unidimensional item factor model with 17 items selected from the instrument to understand the participating GeT students' (preservice teachers) MKT-G growth over the duration of the course. GeT students' MKT-G scores were estimated using a distribution of inservice teachers' MKT-G scores. Specifically, to estimate the growth in GeT students' MKT-G scores using their pre-test and post-test MKT-G scores and interpret the growth in the scale of inservice teachers' MKT-G, we first tested multiple-group measurement invariance between the group of GeT students and inservice teachers. After confirming that the same knowledge construct is being assessed across the groups, the averages of 435 GeT students' pre-test and post-test scores were estimated relative to the inservice teachers by setting the average of 405 inservice teachers' scores to be referenced as zero. Next, the GeT students' growth in MKT-G was estimated by the difference between the estimated post-test and pre-test scores.

Four main results emerge: (1) On average, GeT students score about 0.23 standard deviation units higher on the MKT-G test after completing the Geometry for Teachers course. (2) GeT students taking the MKT-G test score about 0.98 standard deviation below inservice teachers (with an average of 14.2 years of mathematics teaching) that took the same test, on average. (3) The analyses showed that partial measurement invariance was attainable between the groups, meaning that the relationships of the items to the measured knowledge were equivalent between preservice (GeT students) and inservice teachers. (4) the growth in GeT students' MKT-G is equivalent to the difference in MKT-G scores between teachers who differ 3 years in experience teaching geometry.

This study shows the positive association between the college geometry courses designed for future teachers and the mathematical knowledge for teaching geometry in terms of the growth in the knowledge of the students who took the courses. Also, this study contributes to the methodological approach measuring knowledge gains of one teacher population (e.g., preservice teachers) in terms of a scale from a different teacher population (e.g., inservice teachers).

Acknowledgments

This work was supposed by NSF Grant DUE- 1725837.

References

- Ball, D. L., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, 59(5), 389–407.
<https://doi.org/10.1177/0022487108324554>