

Sample only

Course Description Math M.Ed. Fall Year 1

Pedagogies that Support All Students' Learning: Algebraic Thinking
- Winter Year 1

Building on our foundation of *how students learn mathematics*, we will examine how teachers can effectively support student learning. We will identify and modify mathematical tasks to improve students' possibility of successful learning. Task examination will focus on particular learning goals, levels of thinking, and appropriateness for collaborative or individual work. We will combine task selection with instructional strategies that support substantive student learning. Particular instructional strategies will include how to use student-generated ideas to advance collective learning and how to use language and discourse for native and non-native English speakers.

Our mathematical focus will be on algebraic thinking. Historically the public and many teachers believed that algebra was something first encountered in 8th or 9th grade. Today we know that it builds from students' early experiences with number, operation, and patterns. Algebra is also a gatekeeper course for students to achieve higher levels of math and science as well as graduation and financial success. It plays a significant role for students in our society and is therefore important for teachers to understand deeply. Our focus on algebraic sense will include examinations of patterns and functions and relationships among various representations as well as a conceptual development of generalization and proof. This course should expand your understanding of key features of algebraic thinking and develop connections to other mathematical ideas.

Building on our prior work, we will expand our understanding of how to create a learning environment that authentically supports all learners. In particular, how can collaborative group work increase all students' learning, self-efficacy, achievement, and not put "strong" students in the role of worker bee?

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Readings

Boaler, J., & Humphreys, C. (2005). *Connecting mathematical ideas: middle school video cases to support teaching and learning*. Portsmouth, NH: Heinemann.

Cuoco, A., Goldenberg, E. P., & Mark, J. (1996). Habits of mind: an organizing principle for mathematics curricula. *Journal of Mathematical Behavior*, 15(4), 375-402.

Driscoll, M. (1999). *Fostering algebraic thinking: a guide for teachers grades 6-10*. Portsmouth, NH: Heinemann.

Henningsen, M., & Stein, M. K. (1997). Mathematical tasks and student cognition: Classroom-based factors that support and inhibit high-level mathematical thinking and reasoning. *Journal for Research in Mathematics Education*, 28(5), 524-549.

Herbel-Eisenmann, B. A., & Breyfogle, M. L. (2005). Questioning our patterns of questioning. *Mathematics Teaching in the Middle School*, 10(9), 484-489.

Kazemi, E., & Stipek, D. (2001). Promoting conceptual understanding in four upper-elementary classrooms. *Elementary School Journal*, 102(1), 59-80.

O'Connor, M. C. (2002). "Can any fraction be turned into a decimal?" A case study of a mathematical group discussion. *Educational Studies in Mathematics*, 46, 143-185.

Rowan, T. E., & Robles, J. (1998). Using questions to help children build mathematical power. *Teaching Children Mathematics*, May, 504-509.

Stein, M. K., Engle, R., Hughes, E. K., & Smith, A. (in press). Orchestrating productive mathematical discussions: five practices for helping teachers move beyond show and tell.