NATIONAL COMPREHENSIVE CENTER FOR TEACHER QUALITY

Evidence-Based Mathematics Instruction Innovation Configuration

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Authors

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Original Source

This innovation configuration originally appeared in the following resource, which fully describes the innovation configuration, clarifies its purpose, and provides examples of what each component may look like in the classroom.

McGraner, K. L., VanDerHeyden, A., & Holdheide, L. (2011). *Preparation of effective teachers in mathematics* (TQ Connection Issue Paper). Washington, DC: National Comprehensive Center for Teacher Quality. Retrieved May 12, 2011, from http://www.tqsource.org/pdfs/TQ_IssuePaper_Math.pdf

Instructions for Using Innovation Configurations

The following resource describes the content and purpose of innovation configurations, outlines their intended use as syllabus evaluation tools, and provides scoring guidelines and examples for clarification.

National Comprehensive Center for Teacher Quality. (2011). *Innovation configurations: Guidelines for use in institutions of higher education and professional development evaluation.* Washington, DC: Author. Retrieved May 12, 2011, from http://www.tqsource.org/publications/IC_Guidelines.pdf

Introduction

This innovation configuration offers a set of quantifiable indicators of instructional excellence in mathematics. These indicators are related to improved achievement in mathematics and can be used to improve teacher competencies. The innovation configuration is offered as a means of evaluating and aligning teacher preparation and professional development activities to promote stronger learning in mathematics in accordance with recent recommendations of the National Mathematics Advisory Panel.

Evidence-Based Mathematics Instruction Innovation Configuration

Essential Components	Variations					
	Code = 0	Code = 1	Code = 2	Code = 3	Code = 4	Rating
Instructions: Place an X under the appropriate variation implementation score for each course syllabus that meets the criteria specified, from 0 to 4. Score and rate each item separately. Descriptors and examples are bulleted below each of the components.	**There is no evidence** that the component is included in the class syllabus.	Syllabus mentions **content related to the component**.	Syllabus mentions the component and requires **readings and tests or quizzes**.	Syllabus mentions the component and requires **readings, tests or quizzes, and assignments or projects for application.** • Observations • Lesson plans • Classroom demonstration • Journal response	Syllabus mentions the component and requires **readings, tests or quizzes, assignments or projects, and teaching with application and feedback.** • Fieldwork (practicum) • Tutoring	Rate each item as the number of the highest variation receiving an X under it.
Subject-Matter Knowledge in Mathematics • College-level course-taking in mathematics content consistent with grade level(s) taught, including content both preceding and following level(s) taught • Strong knowledge base of the mathematical topics recommended by the National Mathematics Advisory Panel (2008)*						

Mathematic Topics of Student Mastery
• Pedagogical and curricular knowledge of mathematics:
  ▪ Topics of whole numbers, fractions, and geometry (critical foundations of algebra)
  ▪ Symbols and expressions, linear equations, quadratic equations, functions, algebra and polynomials, and combinatorics and finite probability (major topics of school algebra)
• Selection, sequencing, and closure of topics and the appropriate cognitive demand(s) of the task(s) that precede and follow						

* National Mathematics Advisory Panel. (2008). *Foundations for success: The final report of the National Mathematics Advisory Panel.* Washington, DC: U.S. Department of Education. Retrieved May 12, 2011, from http://www2.ed.gov/about/bdscomm/list/mathpanel/report/final-report.pdf

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Knowledge of Mathematics for Teaching • Pedagogical and curricular knowledge of mathematics • How students learn mathematics, including common misconceptions of and errors in students' learning of mathematics • Methods to identify and diagnose students' prior knowledge • How/when to employ particular strategies to address students' (mis)understandings • Methods to support the development of conceptually unpacked knowledge (i.e., how to facilitate students' development of connections and understandings of relationships among mathematics concepts) • Conceptual mathematics activities including, but not limited to, identifying and explaining patterns, developing conjectures and predictions, testing, proving, generalizing, and refuting.						

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Effective Instructional Strategies						
Designing Meaningful Mathematical Activities for Student Learning • Selection and design of instructional tasks and mathematics learning activities • Identification of the mathematics to learn for understanding and the connection thereof to school algebra and to the mathematical learning trajectories of students • The use of both ***teacher-directed*** (e.g., direct, systematic instruction with feedback) and ***student-centered*** (e.g., guided inquiry, open-ended tasks) instructional practices appropriate to students' prior knowledge and mathematics learning goals • Explicit teaching of problem-solving processes using external representations and tools (e.g., charts, diagrams, manipulatives) • Designing multiple entry points for student access to mathematical ideas • Use of and facility with multiple and varied solution strategies to solve problems, processes to support students' formulations of conjectures, arguments, proofs, reasoning, and generalizations • Tools to support learning mathematics with understanding including, but not limited to, external representations (e.g., charts, graphs, diagrams)						

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Classroom Discussion
• Designing multiple entry points for student access to mathematical ideas
• Methods for teacher facilitation of students' mathematical discourse, including:
  ▪ Thinking aloud
  ▪ Making connections among students' responses to mathematical problems
  ▪ Making explicit the steps of problem-solving processes
  ▪ Resolving discrepant answers
  ▪ Questioning and clarifying students' thinking
  ▪ Pressing for mathematical reasoning and explanations						

Assessment of Student Learning • Classwide and supplemental intervention approaches with curriculum-embedded assessment • Construction of formative assessments to identify small increments of learning and growth (e.g., curriculum-based measurement) • Use of formative assessments as instructional, learning, and measurement tools • Analysis of assessment and progress-monitoring data, methods of altering instruction, and interventions based on these data						

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The National Comprehensive Center for Teacher Quality is a collaborative effort of ETS, Learning Point Associates, and Vanderbilt University.

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About the National Comprehensive Center for Teacher Quality

The National Comprehensive Center for Teacher Quality (TQ Center) was created to serve as the national resource to which the regional comprehensive centers, states, and other education stakeholders turn for strengthening the quality of teaching—especially in high-poverty, low-performing, and hard-to-staff schools—and for finding guidance in addressing specific needs, thereby ensuring that highly qualified teachers are serving students with special needs.

The TQ Center is funded by the U.S. Department of Education and is a collaborative effort of ETS, Learning Point Associates, and Vanderbilt University. Integral to the TQ Center's charge is the provision of timely and relevant resources to build the capacity of regional comprehensive centers and states to effectively implement state policy and practice by ensuring that all teachers meet the federal teacher requirements of the current provisions of the Elementary and Secondary Education Act (ESEA), as reauthorized by the No Child Left Behind Act.

The TQ Center is part of the U.S. Department of Education's Comprehensive Centers program, which includes 16 regional comprehensive centers that provide technical assistance to states within a specified boundary and five content centers that provide expert assistance to benefit states and districts nationwide on key issues related to current provisions of ESEA.

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