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The Iowa Core Curriculum and Me: How my Teaching of Mathematics Methods will Change

Catherine M. Miller³

It is an exciting time to be a mathematics educator in Iowa! We are joining the other 49 states by having a set of state standards. In fact, Iowa is exceeding federal expectations by having a curriculum to inform the work of teachers and school administrators. Because of this, we enter an era of change in Iowa and, as we know, change is never easy. To succeed in implementing the Iowa Core Curriculum (ICC) in mathematics all teachers need to learn about it and have help in implementing its core ideas and content. This includes teachers who will begin their careers in this era of change; these are the folks I work with as a methods instructor at the University of Northern Iowa. I need to prepare my teachers for the future, which now includes the ICC.

First, I need to be informed. To serve the future teachers of Iowa, I need to understand the overall philosophy of the ICC and, in particular, be familiar with the mathematics portion. Since I teach secondary methods classes, I'll pay most attention to that portion – but I will not neglect the elementary parts all together. Iowa students experience education as a sequence of classes divided into elementary, middle school/junior high and high school; this is done to organize education for teachers, administrators and buildings. Teachers often find themselves isolated in one of these areas. I think it is imperative that future teachers understand what comes before and after the classes they teach so that what they teach and how they teach makes sense in the continuum of education students experience. So, I must understand the elementary

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portions of the ICC to model this and prepare the future teachers in my class for this continuum.

Visit <http://www.corecurriculum.iowa.gov/> to find information about the soon to be adopted (at high schools) ICC. Here, you can learn about the academic expectations of the ICC, performance standards and essential skills (all searchable by content area). With this information, I have updated the curriculum in my methods course; the changes are highlighted below. Please do not think of this as a standard curriculum for methods courses; it is my attempt to prepare mathematics teachers for their future work.

The Mathematics ICC Vocabulary

ESC, PBITs, MDPs, “essential skills” and “assessment for learning” are all central to the mathematics portion of the ICC (Iowa Department of Education, 2009). These acronyms and phrases will be ringing in the air at schools beginning this fall, if they have not already begun to be used. I want my students to understand what each means and its role in the ICC before they student teach. If the preservice teachers in my classes are familiar with these terms, they can be part of the excitement associated with change and keep up with the teachers they work with during their first years of teaching, including student teaching, who will already have learned about the ICC and probably have begun to implement some of it.

Every student counts

Every Student Counts (ESC) has been a statewide initiative created to improve Iowa student achievement in mathematics. Until recently, there have been three levels of training, elementary (addressing both grade level bands defined by NCTM), middle and high school. These sessions have addressed teaching specific mathematical content and

pedagogy. AEA personnel have been part of the training and are now, in many places, rolling out their own ESC professional development opportunities for classroom teachers and administrators. I was fortunate to have been involved with the middle school planning and presenting team providing me some advance insights into the ICC. The unifying principle of ESC is to teach mathematics for understanding with meaning. You will find this resonating throughout the mathematics portion of the ICC. Because of this alignment, teachers may talk about what they learn or relearn at ESC workshops as they plan to implement the ICC. If there is an ESC session near you (check your local AEA website) you might ask to attend as a guest. You can gain some insights into what will be expected of teachers when the ICC is in place that can inform your work.

Problem based instructional tasks

An integral part of ESC and the ICC is Problem Based Instructional Tasks (PBITs). It is important to note that these are not lessons, but specially designed tasks that may take several class sessions to complete. These are designed to promote student understanding of mathematics. Characteristics of PBITs include:

- Help students develop a deep understanding of important mathematics
- Emphasize connections, especially to the real world
- Are accessible yet challenging to all
- Can be solved in several ways
- Encourage student engagement and communication
- Encourage the use of connected multiple representations
- Encourage appropriate use of intellectual, physical, and technological tools

Iowa Department of Education, 2009

The use of PBITs is research based, calling on what mathematics educators have learned about problem solving when teaching for understanding (e.g. Stein, Boaler, & Silver, 2003, Kilpatrick, Swafford, & Findell, 2001, Grouws & Cebulla, 2000) and the role of discourse in learning meaningful mathematics (e.g. Hiebert & Wearne, 1993). NCTM has long supported the use of problem solving in mathematics class to promote understanding (NCTM, 2000). The use of PBITs is not new, but newly highlighted as an integral part of the ICC.

Meaningful distributed practice

Meaningful Distributed Practice (MDP) is also a core component of the mathematics portion of the ICC. “Practice is essential to learn mathematics. However, to be effective in raising student achievement, practice must be meaningful, purposeful, and distributed” (Iowa Department of Education, 2009). The purpose of MDPs is to provide students an opportunity for quick, meaningful practice with big mathematical ideas. Usually completed within five minutes at the beginning of class, students work independently without manipulatives or technology to do a series of short tasks and then report their findings. Often this time is used to preview or review important mathematical ideas, or practice skills that must be maintained for future student learning. The components of MDPs are defined as follows:

- Meaningful: Builds on and extends understanding
- Purposeful: Links to curriculum goals and targets an identified need based on multiple data sources
- Distributed: Consists of short periods of systematic practice distributed over a long period of time

Iowa Department of Education, 2009

Like PBITs, the rationale behind using MDPs is research based. See Hiebert (2003), Willingham (2002), Kilpatrick, Swafford, and Findell (2001), Kilpatrick & Swafford (2001), or Grouws & Cebulla (2000) for research related to practicing and maintaining mathematical skills. These studies were among those used to inform the ICC's use of MDPs.

ICC essential skills

When I think of mathematical skills students need to master I think of computational fluency, the ability to apply algorithms competently, etcetera. This is not what is referred to as essential skills in the ICC. Instead, the writers of the mathematics ICC documents considered NCTM's Process Standards (2000) when defining skills essential to understanding mathematics. These skills are:

- Problem Solving
- Communication
- Reasoning and Proof
- Ability to Recognize, Make and Apply Connections
- Ability to Construct and Apply Multiple, Connected Representations

Iowa Department of Education, 2009

These skills are called for in response to the demands business and citizenship now require of our students. "Students need powerful skills to be successful in the globally competitive workforce of the 21st century. Business and industry demand workers who can solve problems, work in teams, and are able to apply learning to new and changing situations, especially as workers change jobs and careers many times in

their lifetimes” (Iowa Department of Education, 2009). This change in skill sets called for in the ICC is also grounded in research (see e.g. NCEE 2006, NCTM, 2000, SCANS 1991).

Assessment for learning

Assessment has always been integral to teaching, but when teaching for understanding is the goal it is even more important – especially formative assessment. The authors of the ICC (Iowa Department of Education, 2009) documents and NCTM (in Bush and Leinwand, 2000) use the phrase “assessment for learning” in place of formative assessment. By using this phrase in place of “formative assessment” the need for continuous assessment when teaching mathematics for understanding is emphasized. Assessment for learning, which depends on teachers gathering evidence from multiple sources and then acting on that evidence, can be one of the most powerful forces for learning mathematics (Bush and Leinwand, 2000). Being able to formulate questions, design and implement meaningful tasks, and critically listen to student discourse are all parts of assessment for learning. More about how this is part of the ICC can be found in the PBIT section of the ICC website.

Like the other aspects of the ICC, practicing assessment for learning is supported by research. “Listening to students, asking them good questions, and giving them the opportunity to show what they know in a variety of ways are all affirmed by research to be important ways of increasing student learning” (Wilson and Kenney, 2003). While teachers have always known formative assessment is important, the ICC will increase the need for these assessment practices.

Implications for my Methods Curriculum

The methods class I teach is one of two required of all secondary mathematics teaching majors at UNI. We already emphasize teaching for understanding, big ideas, discourse and problem solving; I must do a better job when teaching assessment practices to my students, something I do not think I have done well. I will focus more on assessment for learning. Weaving formative assessment into a lesson is hard and I need to prepare my students to do this effectively. Otherwise, how can they teach for understanding?

Using ICC terms will also be part of my class. We will discuss PBITs and MDPs and plan some as practice. Additionally, I will visit with AEA mathematics consultants or AEA websites and find examples to share with my students. I may use the PBIT template (not available online, but you can get it from your AEA or by emailing me) for some lesson planning. My goal is that with the ICC vocabulary, emphasis on teaching for understanding and preparation to assess for learning, my students will be prepared to successfully launch their careers in this exciting and challenging time of change.

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