

A Comprehensive Framework For Teacher's Knowledge

Reaching the Goals of Mathematics Teacher
Preparation

Why a New Framework?

- Syllabus Study (Taylor & Ronau, 2006)
- Goals of a Mathematics Methods Course developed in previous AMTE sessions
 1. Beliefs: Analyze and purposefully transform/build upon prospective teachers beliefs and dispositions about what mathematics is and what it means to learn, do and teach mathematics.
 2. Equity: Understand and engage in the enactment of equity and access to quality mathematics for students, parents and communities (including attention to policy).
 3. Student mathematical thinking: Engage prospective teachers in the examination of students work (i.e., listen to, look at, and reflect upon) so that they can make informed instructional decisions.
 4. Reflection: Develop reflective practitioners who analyze their practice from the perspective as a teacher, a researcher, learner, and from the perspective of what and how they see students learn.
 5. Lesson planning/implementation: Develop prospective teachers' skills in designing and implementing lessons that engage students in meaningful learning (tasks, sequence, discourse, questioning).
 6. Pedagogical content knowledge: Deepen and connect mathematical content knowledge with knowledge of pedagogy for teaching mathematics.
- PME Discussion Group

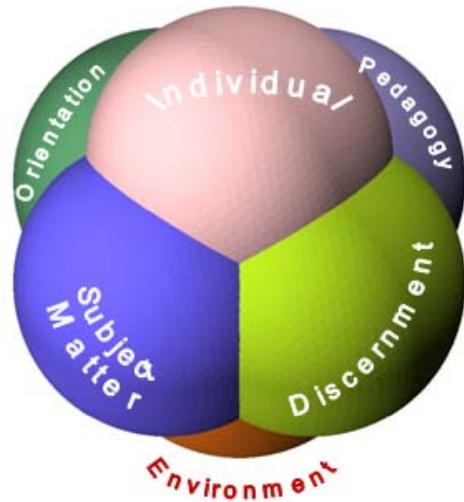
What is This New Framework?

- A model for the overall construct of teacher knowledge
 - Initial focus on teacher preparation (methods courses, Preservice)
 - Additional emphasis on teacher practice (Inservice)
- An expanded structured model, Three dimensions, two aspects each
 - FIELD (Subject Matter & Pedagogy)
 - MODE (Discernment & Orientation)
 - CONTEXT (Individual & Environment)

What Knowledge Frameworks Exist?

- Thinking and Knowing Conceptual Frameworks
 - Shulman, Carparo, et al., Skemp
- Field
 - Subject Matter: Groth, Chinnapan & Lawson
 - Pedagogy: Ward & Anhalt & Vinson, Ball et al.
- Mode
 - Orientation: An, Klum & Wu, Schoenfeld
 - Discernment: Fennema & Franke, Brew
- Context
 - Individual: Gutman, Stemler & Elliot et al.
 - Environment: McClain & Cobb, Davis et al.

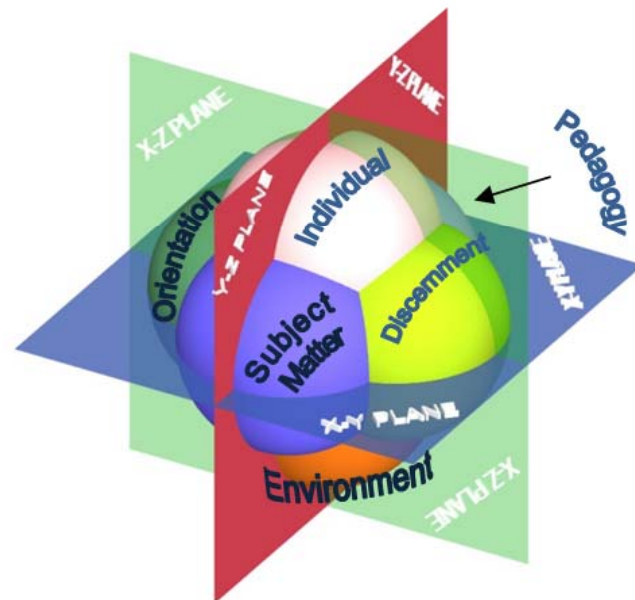
CFTK – 3D Teacher Knowledge



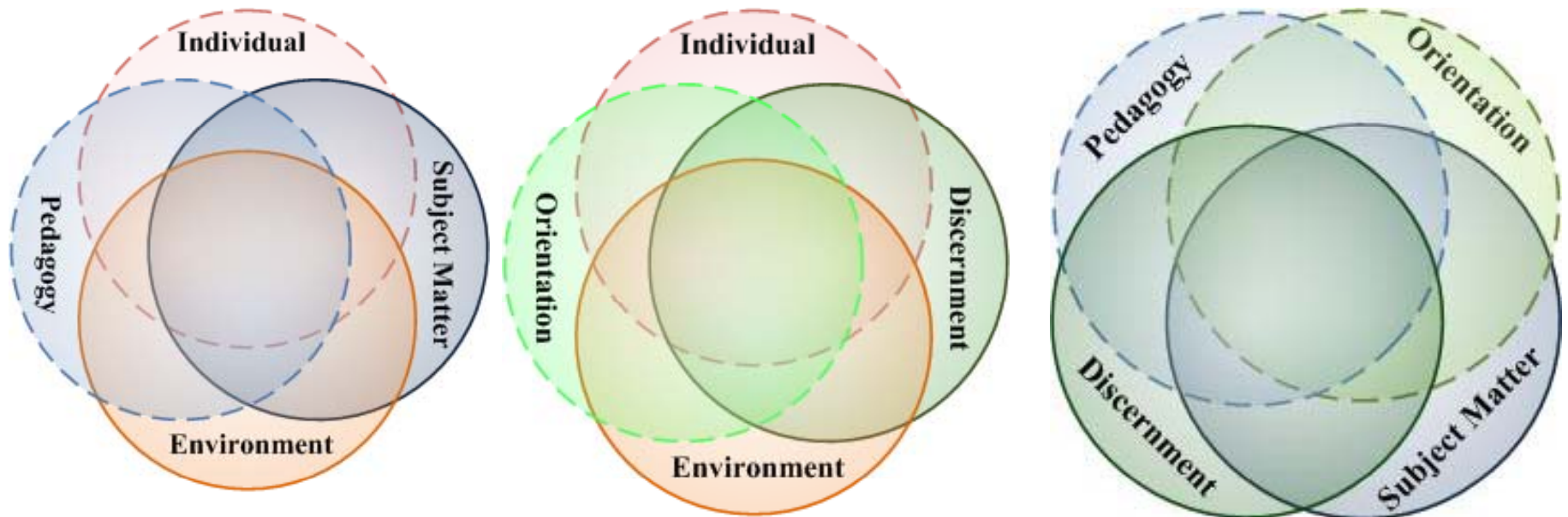
(Front View)



(Back View)



Interactions & Growth in Teacher Knowledge



- What does the model show us?
- What additional issues must we consider?
- Interactions of the aspects above have been expressed as Goals, Principles, and Standards.

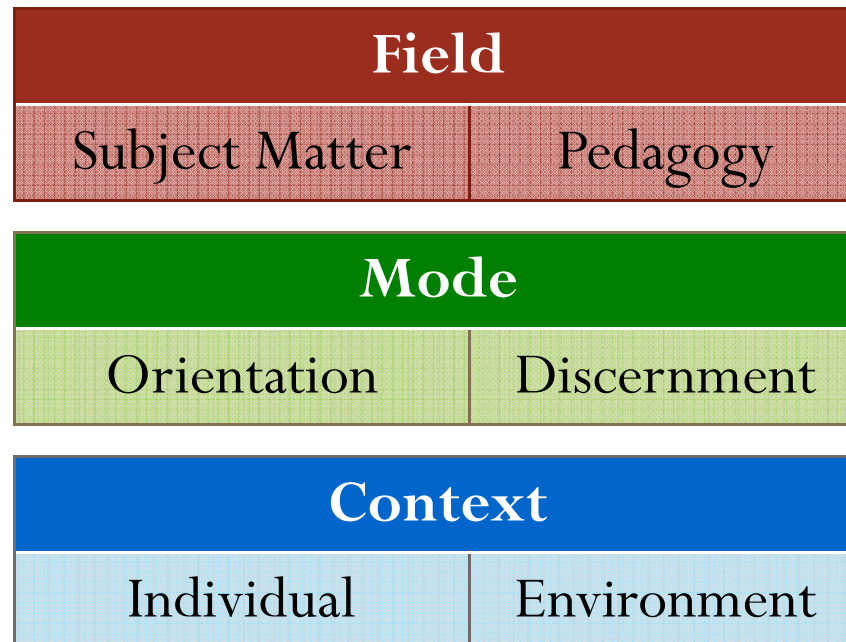
Sources of Principles

- **NCTM**: Principles of Equity, Technology, Curriculum, Teaching, Learning, & Assessment
- **Carnegie Mellon**: Principles of Overcoming expert blind spots, Teaching roles support learning goals, Refinement through reflection (Professional Identity)
- **AAHE**: Principles of Student/faculty interaction, Student collaboration, Active learning, Prompt feedback, Emphasis of time on task, Communication of high expectations, and Respect of diversity.
- **NBPTS**: Principles of Collaboration, Leadership, and High Expectations

Sources of Principles

- **NCATE** standards require that professional education programs prepare candidates who:
 - have the content knowledge needed to teach students
 - have the pedagogical and professional knowledge needed to teach effectively
 - operationalize the belief that all students can learn
 - demonstrate fairness in educational settings by meeting the educational needs of all students in a caring, non-discriminatory, and equitable manner
 - understand the impact of discrimination based on race, class, gender, disability/exceptionality, sexual orientation, and language on students and their learning.
 - can apply their knowledge, skills, and professional dispositions in a manner that facilitates student learning
- **SACS** standards address the following areas:
 - Vision and Purpose
 - Governance and Leadership
 - Teaching and Learning
 - Documenting and Using Results
 - Resources and Support Systems
 - Stakeholder Communications and Relationships
 - Commitment to Continuous Improvement

CFTK Impact on Research



CFTK Impact ON AMTE 2007 GOALS

- Beliefs: (Orientation)
- Student mathematical thinking: (Discernment)
- Reflection: (Discernment)
- Lesson planning/implementation: (Pedagogical Knowledge)
- Pedagogical content knowledge: (Intersection of Subject Matter & Pedagogical Knowledge)
- Equity: (Intersection of Context-Mode-Field)

Group Work: Rethinking Goals/Activities using CFTK

- How does CFTK change specific goals in your methods course?
- To what degree does the CFTK model help integrate different goals and activities in your methods courses?

Wrap Up:

*(Here are some of the goals we
worked on and our results)*

Goal 1– Incorporating Mode

- **1D: Beliefs:** Analyze and purposefully transform/build upon prospective teachers' beliefs and dispositions about what mathematics is and what it means to learn, do and teach mathematics.
- **2D: Orientation:** Prepare pre-service teachers to analyze and purposefully transform and/or build upon their beliefs and dispositions about what mathematics is and what it means to learn, do and teach mathematics.

Goal 1– Incorporating Mode & Context

- **2D: Orientation:** Prepare pre-service teachers to analyze and purposefully transform and/or build upon their beliefs and dispositions about what mathematics is and what it means to learn, do and teach mathematics.
- **3D: Orientation:** Promote and support classroom structures that entice pre-service teachers to collaboratively analyze and purposefully transform and/or build upon their orientation (e.g., beliefs, values, goals, culture, gender, and their interactions), as leaders of a dynamic, innovative profession, about what mathematics is and what it means to learn, do and teach mathematics.

Goals 2 & 4– Incorporating Mode

- **1D: Student mathematical thinking**: Engage prospective teachers in the examination of students work (i.e., listen to, look at, and reflect upon) so that they can make informed instructional decisions.
- **1D: Reflection**: Develop reflective practitioners who analyze their practice from the perspective as a teacher, a researcher, learner, and from the perspective of what and how they see students learn.
- **2D: Discernment**: Engage prospective teachers in the examination of students work (i.e., listen to, look at, and reflect upon) so that they can make informed curricular, instructional and assessment decisions. Develop reflective practitioners who analyze their practice from the perspective as a teacher, researcher, learner, and from the perspective of what and how they see students learn.

Goals 2 & 4– Incorporating Mode & Context

- **2D: Discernment:** Engage prospective teachers in the examination of students work (i.e., listen to, look at, and reflect upon) so that they can make informed curricular, instructional and assessment decisions. Develop reflective practitioners who analyze their practice from the perspective as a teacher, researcher, learner, and from the perspective of what and how they see students learn.
- **3D: Discernment:** Enhance prospective teachers' cognitive and meta-cognitive skills by engaging them in the examination of students' work so that they can develop the ability to reason, judge, weigh alternatives, and reflect in order to make informed curricular, instructional and assessment decisions.

Goal 3 – Incorporating Mode

- **1D: Lesson planning/implementation:** Develop prospective teachers' skills in designing and implementing lessons that engage students in meaningful learning (tasks, sequence, discourse, questioning).
- **2D: Pedagogy:** Develop prospective teachers' skills in designing and implementing lessons that engage students in a process of inquiry for meaningful learning (tasks, sequence, discourse, questioning).

Goal 3 – Incorporating Mode & Context

- **2D: Pedagogy**: Develop prospective teachers' skills in designing and implementing lessons that engage students in a process of inquiry for meaningful learning (tasks, sequence, discourse, questioning).
- **3D: Pedagogy**: Create flexible structures that promote collaborative development and assessment of prospective teachers' skills in designing and implementing lessons that engage P-12 students in a process of inquiry for collaborative, meaningful learning (tasks, sequence, discourse, questioning) and peer and self assessment (reflection, metacognition, group dynamics, integrity) in a supportive and challenging classroom environment.

Goals 5 & 6 – Incorporating Mode & Context

- **1 D: Pedagogical content knowledge:** Deepen and connect mathematical content knowledge with knowledge of pedagogy for teaching mathematics.

Goal 5 is an interaction, within Field in the CFTK model.

- **1D: Equity:** Understand and engage in the enactment of equity and access to quality mathematics for students, parents and communities (including attention to policy).

Goal 6 is an interaction across all dimensions in the CFTK model.