A Needs Assessment of Teacher Educators in Texas: Issues in Implementing STEM and College and Career Readiness Standards

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A shortage of highly-qualified science, technology, engineering, and mathematics (STEM) teachers currently exists within the state of Texas.

30% of Grades 6-8 mathematics teachers and 32% of Grades 6-8 science teachers in Texas were teaching out-of-field (TEA, 2011).

14% of Grades 9-12 mathematics teachers and 31% of Grades 9-12 science teachers were teaching out-of-field (TEA, 2011).
Background

The lack of qualified teachers in mathematics and science often results in students losing interest in the subjects of mathematics and science and therefore being ill prepared in these subjects.

Because Texas is seeing a lack of students pursuing and graduating from STEM programs, the issue of teacher quality has become a major concern.
Purpose

The present study reports the results of a statewide needs assessment that was administered to teacher educators across the state of Texas.

The survey addressed issues related to implementing (a) STEM content and (b) Career and College Readiness Standards in teacher education programs.
Methods

A request to take the online needs assessment survey was sent to about 1,000 teacher education faculty across the state of Texas during the 2014 spring semester.

Faculty were identified from websites of the 30 Texas universities that produced the most STEM teachers (THECB).

Other faculty who attended CCR Institutes were also included.

A total of 317 teacher education faculty responded to the survey (Response rate = ~30%).
Survey Participants

- Primarily female (66%)
- Primarily Caucasian (77%)
- Courses Taught
  - General teacher education (33%)
  - Mathematics methods (21%)
  - Science methods (18%)
  - English/Language Arts methods (11%)
  - Social Studies methods (6%)
Results

Teacher Education Program Approach to STEM:

• 53%--Teach about each subject area (science, math, technology) separately with little or no integration of the subjects

• 36%--Teach how to fully integrate STEM into the curriculum

• 11%--Do not teach about STEM education
CCRS Results

Familiarity with Texas CCRS:

- 44%--Very Familiar
- 31%--Moderately Familiar
- 18%--Slightly Familiar
- 7%--Not at all Familiar
CCRS Results

- 81%--Strongly agree or agree that implementation of Texas CCRS will improve K-12 students learning
- 92%--Strongly agree or agree that preservice teachers need to learn about the Texas CCRS in their teacher preparation program
CCRS Results

Extent that Texas CCRS are implemented in teacher prep program:

- 16%--Great extent
- 46%--Moderate Extent
- 30%--Minimal Extent
- 9%--Not at all
Results

Over 75% of the participants indicated that there is a substantial or moderate need for preservice teachers to receive additional preparation in the following areas:

- Creating lessons that integrate STEM subjects
- Creating lesson plans that are aligned with the Texas CCRS
Results

• Creating lesson plans that are aligned with the Texas CCRS
• Deepening STEM content knowledge
• Deepening knowledge of CCRS
• Differentiating instruction for all students when teaching STEM subjects
• Integrating STEM subjects
• Implementing STEM content in the curriculum
• Teaching STEM subjects to ELLs
Results

Percentage of preservice teachers who are “highly qualified” to do the following tasks:

• 49%--Use inquiry-oriented teaching strategies
• 29%--Create lesson plans that are aligned with Texas CCRS
• 27%--Create lesson plans that integrate STEM subjects
Results

• 27%--Integrate Texas CCRS into teaching
• 27%--Implement integrate STEM content within the existing curriculum
• 24%--Differentiate instruction for all students when teaching STEM subjects
• 20%--Teach STEM subjects to English language learners (ELLs)
CCRS Needs

What would you like to learn about the CCRS?

Everything/Overall Introduction
- Everything
- What they are
- All of it
- I need to learn basics and how to incorporate it into my courses

Integration into Younger Grades
- How to integrate the CCRS into the elementary curriculum
- How to integrate in EC-8 curriculum

Questioning the Emphasis of CCRS (College v. Career)
- How it prepares students beyond the career
- Why is the primary emphasis toward the college preparation track and not toward the career prep track?
- Why are there no ‘career’ standards included?
CCRS Needs

What would you like to learn about the CCRS?

Integration with Other Standards
• How does CCRS interact with the TEKS?
• Alignment with TExES domains and competencies
• Relationship to other standards
• How to they specifically relate to TEKS?

Diverse Learners
• How they address students with learning disabilities
• How do the standards apply to minority students?
• Diverse learners?
STEM Needs

What concerning STEM education would you like to learn more about?

Best Practices/Practical Examples of STEM Integration
- Exemplars of integrated curriculum
- I would like specific examples of lessons/activities integrating STEM
- How to integrate it into my courses
- How to help preservice and inservice teachers effectively teach STEM content

More about Technology and Engineering Instruction and Integration
- Engineering applications; pedagogy for technology
- Engineering aspect of STEM
- Integrating engineering and technology into the curriculum

STEM Assessments
- How will STEM learning be examined and assessed in Texas high schools?
- How “effectiveness” is measured?
- Authentic assessment
STEM Needs

What concerning STEM education would you like to learn more about?

Integration into Younger Grades

- *Everything can be taught if you find an authentic way to teach it—how do you propose to teach STEM to young children PK-2?*
- *Fun STEM experiments that can be done in elementary classrooms*
- *How to address engineering concepts for elementary pre-service teachers*
- *Using technology effectively with young learners; using STEM in early childhood*

Diverse Learners

- *Understanding more about how teachers can encourage members of minority ethnic groups and girls to engage in STEM fields*
- *How to get more minorities and ELLs in STEM*
- *How to promote STEM education in struggling schools, where the priorities are focused on test preparation*
What hinders teachers from implementing the CCRS in their instruction?

**Time**
- Lack of time
- Planning time
- Too much other stuff to teach

**Standardized Testing**
- Rampant emphasis on teaching to the test
- Test-based curriculum
- Teachers are overwhelmed with STAAR prep

**Lack of Understanding/Unknown**
- Lack of understanding of CCRS
- It’s unknown to them
- They don’t know what the standards are and are used to ‘doing their own thing’
- Not fully aware of CCRS
What hinders teachers from implementing integrated STEM education in their classrooms?

Fear/Limited Knowledge of STEM Subjects
- Fear of science and math
- Lack of knowledge of the subject matter
- Their limited knowledge and understanding of science
- The teachers have a fear of sciences thinking it is too hard

Time
- Lack of time (too many topics to cover)
- They don’t have dedicated time to do extensive lab or inquiry work in the school day so they fall back on packaged products

Funding/Lack of Support
- Lack of adequate technical equipment
- Lack of support
- Lack of resources
- Funding issues
What hinders teachers from implementing integrated STEM education in their classrooms?

**Standardized Testing**
- District requirements to teach to the STAAR test
- Undue pressure throughout the academic year to prepare for end of year STAAR test
- Administrators asking teachers to teach to what is tested

**Lack of Preparation**
- Lack of practical instruction and experiences
- In our secondary program. There aren’t STEM methods courses
- Lack of experience teaching integrated STEM. Teachers need the chance to practice teaching this way.

**Curriculum Constraints**
- Rigid curriculum, not much freedom to make changes
- Overloaded curriculum
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