



# A Study of CCMS Procedures in Curriculum Design and Teacher Education in Support of Diverse Students Learning Science



James J. Gallagher and David McLaughlin  
 Michigan State University

## Objective of the Investigation

• To document the nature and extent of the attention that CCMS partner institutions have given to the science learning needs of students from diverse backgrounds during the five years of project activity.

## Background & Procedures

Statistics indicate a continuing increase in the diversity of the nation's public school student population when considering children who belong to racial or ethnic minorities, speak a language other than English at home, and receive special education services (U.S. Department of Education, 2007). Serving the needs of diverse science learners is designated as one of the core operating principles guiding the work of CCMS.

Thirteen in-person and phone interviews were conducted with CCMS personnel at the four partner institutions including project coordinators, professorial staff, post-doctoral fellows, and graduate students. Questions focused on consideration of the needs of diverse learners in the design and use of curriculum materials, teacher education and staff development, and preparation of future leaders in science education. Responses were analyzed for recurring themes and supporting evidence.

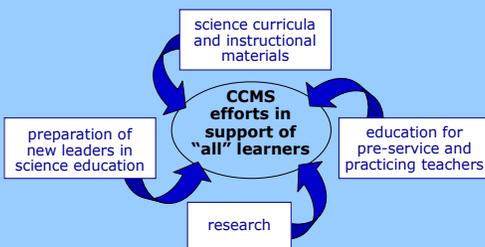
## A Focus on "All" Learners

Interviews revealed a broad and inclusive focus on "all learners" rather than a systematic attention to specific student sub-populations. At the same time, demographic data of schools and school districts were used strategically in sampling techniques for research and development work.

High quality curriculum materials and effective instructional strategies were seen to possess characteristics allowing them to work across diverse student groups. These include engaging learners with relevant scientific phenomena, relating new concepts to prior knowledge and experiences, and presenting opportunities for students to make their thinking visible.

*"In our pilot testing and field testing, we make sure that we cover the range of students from low-performing students to high-performing students. We're just doing some field testing now but we made sure that we got the urban representation, the suburban representation, and the rural representation. So we try to get as much as we can from as wide a range as we can."*

*"A lot of good instructional techniques tend to work with a variety of different people. ... We design a lot of curriculum working with the Detroit Public Schools. Some of those curricula ended up working just as nicely in more affluent suburban areas."*



## Curriculum Materials

Curriculum materials are known to act as primary supports in the teaching of science (Lynch, Kuipers, Pyke, & Szesze, 2005) yet often of poor quality (Kesidou & Roseman, 2002). Responses indicated that consideration of the learning needs of diverse students appeared in the design of science curricula and instructional materials in a number of ways including:

- educative features that attend to teachers' content knowledge and pedagogical practices
- meaningful, personalized contexts and multiple examples that students can relate to their prior knowledge and experiences
- a "developmental focus" that takes into account students' initial ideas and helps teachers build on them over time
- a focus on accessibility of language and use of culture-bound contexts
- inclusion of data having multiple possible interpretations allowing for a diversity of student ideas to be expressed and encouraging evidence-based argumentation

*"When thinking about making the references meaningful for all kinds of learners, what we would really like to do is to find ways to honor different kinds of resources that kids bring into the classroom"*

*"You don't want the language to impose an extra challenge either because they're English as a second language student or because just their reading skills are not as good as the other kids. So [a literacy expert] really pushes us a lot on that and goes over everything that goes into the classroom that a kid will see."*

## Teacher Education

The teaching force of the nation's schools is known to show little of the same diversity found in the student population (Banks et al., 2005). Being able to recognize similarities and differences in students' backgrounds and experiences along with a strongly held belief that all students are capable of learning are essential characteristics of science teachers today (National Research Council, 1996). In their discussions of supports and activities in teacher education and professional development, participants described a focus on:

- eliciting, valuing, and building on students' conceptual understandings
- appreciating the diversity of ideas and experiences that occur within apparently homogenous populations
- developing preservice teachers awareness of students' home environments through community visits and interviews
- using knowledge of students as a lens for productively analyzing curriculum materials
- facilitated discussions around current literature and hypothetical classroom scenarios emphasizing students' diverse resources for learning
- development of multiple frameworks for scaffolding preservice teachers' thinking about subject matter, learning goals, and who their students are

Teachers' views and understandings of science, their role in the classroom, and presumed homogeneity were identified as potential obstacles to getting to know students and adequately attending to their learning needs.

*"We really try to help the preservice elementary teachers understand that kids have a range of ideas about scientific phenomena. We help them think about how reasonable kids' ideas are [and help] them recognize the level of rationality that's behind any idea that a kid has regardless of whether it's scientifically normative or not."*

*"I think that many of them view their role as teachers to come in the class to direct the class and contain the class and present information. ... If you take that perspective it makes it very difficult to hang out and just watch and listen and see and ask."*

*"I had my students interview a family in their field placement. ... They often said that they liked that because they had never talked to the parents of these kids. Those sort of personal experiences often lend themselves to generous understandings rather than critical understandings."*

## Preparing New Leaders

CCMS prepares new leaders in the field of science education through its work with graduate students and post-doctoral fellows.

Mentoring processes specific to the science learning needs of diverse students were not identified. Interviewees described an apprenticeship model of training where graduate students and post-doctoral fellows are intimately involved in the regular and authentic research and teacher education activities at each partner institution.

*"The model at Michigan is very much one of apprenticeship and a lab in that there's a group of people working on a problem much like you would see in a chemistry research lab or a physics research lab or a biology research lab where there's several people working as a group trying to solve a problem, working together, talking to each other, wrestling with the idea."*

*"Our way of doing it is to have them become absorbed into our process, our work."*

## Concluding Comments

While none of the interview participants considered themselves scholars or experts in the field of diversity, the majority ranked the needs of diverse learners "moderately" or "highly" central to their work.

Attention being given by CCMS to the science learning needs of diverse students may be partially obscured by a focus on all learners rather than targeted subgroups, by the variety of forms this attention has taken in the multiple contexts of CCMS work, and by its largely implicit nature in the endeavors of CCMS partner institutions.

Interviews were effective at exposing some of this attention but also brought to the forefront numerous challenges that inhibit the effectiveness of these and other efforts. Innovative and sustained initiatives will no doubt be critical to facing these challenges and better serving the nation's science learners in the future.

*"I think the needs of diverse students has certainly been moderately central to my work. I haven't made that a central theme. I haven't written and pulled these things together around that. I would say that's what it means to make it central is you bring that to the foreground, you organize around that, you write about it and so on. It's moved into a key position but I would say it's probably still at a 4 [moderately central]."*

## References

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