Transitioning to an Integrated Science Teaching Model: Easier Said than Done

Ashley Iveland, Elizabeth B. Dyer, Edward Britton, Burr Tyler, and Joshua Valcarcel
aivelan@wested.org, edyer@wested.org, tbritto@wested.org, btyler@wested.org, jvalcar@wested.org
WestEd

Abstract: This poster presents a study of eight school districts implementing a new integrated model of science instruction in the middle grades aligned with NGSS. The analysis uncovers how districts created implementation plans and how teachers and administrators initially are responding to them, sometimes in more limited ways than envisioned. The findings suggest the importance of attending to transitional as well as end-goal implementation phases of innovations, and the importance of administrators facilitating the transition.

Introduction

The Next Generation Science Standards (NGSS) advocate for an integrated model of science instruction in which different science domains are connected rather than separated. For example, the NGSS calls for basing instruction on authentic phenomena, which are best explained by examining all of the science disciplines involved (National Research Council, 2012). This shift is unique because it has equally important implications at the classroom level (e.g. what phenomena teachers use in instruction) and the systemic level. In particular, all scientific disciplines, such as earth, space, life, and physical science, in addition to engineering, should be included and connected in a single year of instruction, leading schools and districts to reorganize their course sequences. During recent decades in California and the US, middle school science has most frequently been taught in discipline specific courses (e.g. California's sequence of earth science in grade 6, life science in grade 7, and physical science in grade 8). With the advent of NGSS, California's State Board of Education has shifted to give preference to an integrated model for middle school science. This new context represents a key state-wide policy shift with important, but potentially diverse, impacts for schools and teachers.

This study investigates how teachers, schools, and districts in California initially made sense of the transition from discipline-specific to integrated models, and the challenges teachers identify with that transition. As such, this study aims to contribute to literature on teacher change, teacher learning, and implementation across educational systems. This focus on districts, schools, and teachers reflects an actor-oriented perspective toward NGSS implementation, which highlights how NGSS implementation depends on the sense-making and decisions of relevant actors (Coburn, 2006; Penuel, Phillips, & Harris, 2014; Spillane, 2012).

Methods

The data informing this study come from a project involving eight public school districts across California that are early implementers of NGSS (http://k12alliance.org/ca-ngss.php). This project provided ongoing and intensive professional development and other support to K-8 teacher leaders and administrators around NGSS implementation, and included integration as one of many topics. The districts represent a variety of locations, sizes, and demographics within California, and were selected through a competitive application process, which required districts to commit to California's preferred integrated model of science education at the middle grades.

The following analyses are based on data from the first two years of the project, and include written artifacts created by the district, interviews with each district's project director and leadership teams, and surveys completed with school and district administrators, as well as teacher leaders participating in the project activities. All districts created comprehensive plans for NGSS implementation. These artifacts were qualitatively analyzed for mentioning the transition plan toward the integrated model for science instruction. Interviews with project directors asked about plan for integration, and these responses were summarized holistically and triangulated with the district plans. The surveys administered contained an open-ended question that asked respondents to identify the "biggest challenges in implementing the integrated science model." These responses were open-coded (Strauss & Corbin, 1998) to identify common challenges across participants.

Findings

All of the districts' initial NGSS implementation plans included the goal of integrated middle school science. However, only two of the eight included specific, multi-year plans for transitioning to integration. Instead, most districts indicated they would develop plans in the future or named activities that would support integration (e.g. teacher PD on integration with their curriculum). The two specific plans considered how to provide continuity for

both students and teachers (e.g., avoid gaps in instruction and repeated science content as a result of the shift in course sequence), and had transitional models of incomplete integration, such as a "coordinated" model in which science classrooms engage students in each discipline each year, without making vital connections between them.

Interviews with leadership teams in the districts revealed the complicated negotiations and transitions for individual teachers and administrators, reflecting different concerns than continuity or dedicated project activities around integration, which were highlighted in the district plans. For example, one principal shared a challenge for teachers, letting go of teaching their favorite science topics, when supporting integration,

> The Integrated Model calls for cells to be taught in grade 6 instead of 7. But my 7th grade life science teacher loves teaching cells and really didn't want to let go of this topic. And the 6th grade teacher was intimidated…the need to transition over several years turned out to be a blessing…the 7th grade teacher still gets to teach it for one more year. But the 7th grade teacher also had to seriously help the grade 6 teacher with cells…[after that transition year] the 7th grade teacher initially was caught off guard by the reality of not being able to teach cells anymore…[but] was getting excited about teaching some new things.

The school administrators and teachers also noted challenges related to science equipment and materials. One principal shared her role in negotiating the transition as it related to equipment,

> Everyone had to be transparent about what [supplies] they actually already had…It took my low-key involvement in some meetings to inventory everything and figure out where it should now be. And since sometimes more than one grade is teaching a topic during the transition, when and how two different teachers had them had to be synchronized.

These challenges were also expressed by teacher leaders in the study. In teachers' responses to an open-ended prompt about the biggest challenges in transition to the Integrated model, 17% indicated a lack of existing curricula and/or science material resources, and 16% mentioned a specific science topic that would be challenging to teach. Teachers also indicated a lack of content knowledge required by the revised courses (12%); time needed to learn, plan and implement changes (10%); opportunity to collaborate with other teachers (7%); and ability to identify real-world phenomena that authentically involve multiple disciplines (7%).

Conclusions

The findings presented showcase how different challenges and concerns arise for actors working at different levels in the implementation process (i.e., district, school, classroom). These challenges highlight the importance of paying attention to the implementation process, as well as considering the learning happening during this process across a district or educational system. In particular, there were concerns that frame the problems with transition in terms of a resource management logic, such as access to materials, as well as a resource development logic, such as developing teachers' capacity to teach new science topics (Horn, Kane, & Wilson, 2015). The findings also highlight how school administrators can be active agents in facilitating teachers' transition challenges, supporting teachers to work collaboratively across boundaries of grade and science discipline. Future data collection from subsequent years of implementation in this project will shed further light about the final stages of the transition toward the integrated model across districts and schools.

References

Coburn, C. E. (2006). Framing the Problem of Reading Instruction: Using Frame Analysis to Uncover the Microprocesses of Policy Implementation. *American Educational Research Journal*, *43*(3), 343–349.

Horn, I. S., Kane, B. D., & Wilson, J. (2015). Making Sense of Student Performance Data: Data Use Logics and Mathematics Teachers' Learning Opportunities. *American Educational Research Journal*, *52*(2), 208–242. https://doi.org/10.3102/0002831215573773

National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.

Penuel, W. R., Phillips, R. S., & Harris, C. J. (2014). Analysing teachers' curriculum implementation from integrity and actor-oriented perspectives. *Journal of Curriculum Studies*, *46*(6), 751–777.

Spillane, J. P. (2012). Data in Practice: Conceptualizing the Data-Based Decision-Making Phenomena. *American Journal of Education*, *118*(2), 113–141. https://doi.org/10.1086/663283

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research techniques*. Thousand Oaks, CA: Sage Publications.