INCLUDING STUDENTS AND TEACHERS IN THE CO-DESIGN OF THE ENACTED CURRICULUM

Abstract

This paper highlights two strategies to include students and teachers as partners in the co-design of the enacted curriculum. During the development cycle, the design team developed sixteen lessons that included inquiry opportunities, small group conversations, and multiple perspectives around complex issues. The lessons were implemented during three classes, all taught by the same teacher who also participated on the design team. Findings show that including students in the design of materials and paying attention to how teachers change from enacting materials can provide curriculum designers with tools for creating materials that support students and teachers as co-designers and co-evaluators of the enacted curriculum that enhances teaching and learning for understanding.

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Traditional design, implementation, and evaluation curriculum design projects focus on developing instructional approaches that address specific learning goals. In the popular backwards design model, for example, designers articulate the learning goals, write the assessments, and then develop lessons that will move students towards building an understanding of those learning goals (Wiggins & McTighe, 1998). Curriculum designers follow this iterative approach, with groups of teachers trying out the lessons and providing feedback to the designers; designers test student achievement using the new lessons, and then revise the lessons until they are satisfied that the lessons are helping students understand the learning goals. This approach, however, assumes that the curriculum designers can develop lessons, that implemented well, will achieve the desired student outcomes. The approach does not consider students and teachers as partners with the curriculum materials in the design of the enacted curriculum.

This project utilizes two approaches to include students and teachers in the design of the enacted curriculum in order to support students and teachers in learning and teaching for understanding. The first strategy addresses student participation in the development of engaging and motivating curriculum materials. The second strategy examines how teachers change and learn from their use of curriculum materials.

Theoretical Framework

Wiggins and McTighe (1998) emphasize the importance of creating learning goals that are engaging to students and designing activities that sustain student interest. Only when students are engaged in learning will they learn for understanding and retain essential knowledge over time. Wiggins and McTighe offer suggestions for piquing student interest and designing questions that are intrinsically motivating. However, in searching for ways to motivate and engage students, curriculum designers often view students as the receivers of the intended curriculum, rather than as potential evaluators and critics of the curriculum.

Co-generative dialogue (Eldon & Levin, 1991; Roth, Lawless, & Tobin, 2000; Roth, Tobin, & Zimmerman, 2002) has been suggested as a method of participation where students, along with researchers, supervisors, and teachers participate in conversations to improve teaching and learning through dialogue. This process is "intended as a practice for generating new action potential" (Roth, Lawless, & Tobin, 2000, p. 5). In co-generative dialoguing, students play a vital and active part in the teaching and learning process by for providing their perspectives in the critique and revision of curriculum material.

Similarly, curriculum designers seldom consider the full potential of teachers as co-designers of curriculum materials. Traditionally, curriculum designers view teachers as either transmitters of the intended curriculum or as active implementers of the curriculum materials (Connelly & Ben-Peretz, 1997). Designers may seek teachers' input during formative stages of the development project and ask for teachers' feedback during implementation, but these roles assume that teachers merely play a supportive role in the educative process. Wiggins and McTighe (1998) take an opposite view by assigning to teachers the sole role of curriculum developers. This approach fits the Drawing-On perspective of Remillard (In Review), which assumes that teachers have exclusive agency over the curriculum, as well as the time and resources to create curriculum and curriculum materials from scratch. In this role as co-designers, teachers act as decision-makers who operate in the complex learning context of the classroom to co-create the enacted curriculum with the students and the curriculum materials (Connelly & Ben-Peretz, 1997; Remillard, In Review).

Two hurdles impede teachers in becoming participators with the curriculum materials and students in the co-design of the enacted curriculum. First, both teachers and curriculum developers are unfamiliar with the changed roles they are required to play in this partnership (Connelly & Ben-Peretz, 1997). Teachers are more comfortable adapting the implementation of materials than viewing themselves as critical users and co-designers of curriculum. Similarly, curriculum designers are more comfortable as the creators of materials rather than as partners with teachers in the design of the enacted curriculum. This new view requires that curriculum designers recognize the dynamic relationship between teachers and curriculum materials and understand that the enacted curriculum reflects both the intent of the designers and the demands of the classroom learning situation (Connelly & Ben-Peretz, 1997; Remillard, In Review). Developing materials with this changed view of the role of teachers in co-creating the enacted curriculum means that curriculum researchers need to understand better how teachers change and learn from their use of curriculum materials. The second hurdle for teachers in developing a participatory relationship with curriculum materials is that there are few materials that can support such a relationship with teachers. Materials designed to be strictly followed or adapted

upon implementation do not avail themselves to supporting multiple outcomes (Connelly & Ben-Peretz, 1997).

Curriculum Development Process

Water for People and the Planet is a curriculum materials design project that focuses on surface water and groundwater issues related to ensuring a good quality water supply for residents of Earth. The research and development team developed 16 lessons for a four-week high school-level unit that includes inquiry opportunities in the context of local and global real-world situations, encourages small group student conversations, and addresses multiple perspectives around complex science and social issues. There are three purposes behind this project that are relevant to the design project and findings of this paper. First, this project serves as an exploratory laboratory to look at specific aspects of the curriculum design process. As such, it is not the intent of this project to produce a large-scale curriculum product. Secondly, this project focuses on local issues in a local setting. The project addresses groundwater and surface water issues in the context of the local environment, and it addresses pedagogical issues relevant to the setting and pedagogical needs to the students and teacher. Finally, the intent of this project was to serve as a learning opportunity for graduate students and post-doctoral students learning to develop curriculum materials. As such, while some of the findings of this project may not be novel, they served as key learning experiences that highlighted aspects of curriculum development that might not otherwise have been addressed or highlighted in the process of learning to design curriculum materials. While lessons learned from this study may inform other curriculum designers and researchers in their attempts to build curriculum materials supportive of teachers as co-creators of the enacted curriculum, the main intent of this project is to serves as a case to explore closely how a teacher and his students work to make sense of new curriculum materials designed to meet the needs of the teacher and students in their particular situation.

The development team consisted of four university curriculum designers/researchers and one classroom teacher, Mr. V. Mr. V. volunteered to participate in this project because of his interest in curriculum development. The students in Mr. V's biology classes represented diverse ethnic, socio-economic, and academic backgrounds. This setting provided a context for understanding how students of diverse backgrounds perceive and interact with the curriculum materials and how the teacher interacts with the materials to co-construct an enacted curriculum that addresses the diverse needs of the students in the classes. During the initial conceptualization of the curriculum materials and writing of the first draft of the lessons, Mr. V. was present at all design meetings and participated on an equal status level as the other members of the design team. Mr. V. provided ideas, wrote drafts of lessons, and provided valuable critique of ideas and lessons. As a result, Mr. V. served as a generator and judge of ideas and provided an important voice and perspective in the initial work on the lessons, a role that teachers involved in curriculum materials design usually do not play (Connelly & Ben-Peretz, 1997).

During the enactment phase of the project, this same teacher enacted the lessons in two stages. In stage one, Mr. V. enacted the lessons in two class periods, back to back. The students in the two classes were enrolled in the same course and represented the same population of students. The university researchers observed and video-taped every lesson. Mr. V. and university researchers debriefed each lesson immediately after enactments, identifying challenges that either students

were having in learning the material or Mr. V. was having implementing the lessons. Mr. V. and university researchers agreed on modifications to the lessons that Mr. V. would implement the following day. In addition, the university researchers made modifications to the materials based on the debrief sessions and classroom observations. Mr. V. implemented these revised materials during stage two of the enactment. This stage occurred after the first enactment was complete. During this stage, Mr. V. taught the slightly revised materials to a third class of students. The researchers again observed and videotaped lessons and met with Mr. V. in post-enactment debriefing sessions each day.

Because one of the intents of this curriculum design project was to understand student interactions with the materials and include students in the evaluation and critique of engaging and motivating lessons, the project included three student co-generative dialogue sessions. During these sessions, groups of three to ten students participated in one-hour lunch-time meetings to critique the unit and to discuss what they learned. Students viewed segments of videotapes of themselves participating in the lessons and commented on their experiences, actions, and motivations in a manner similar to the stimulated recall technique (Borko & Shavelson, 1990). Analysis of the student co-generative dialogues, along with classroom videotapes, student work, and student interviews provided information on how well the lessons functioned in helping students develop understanding of the learning goals, the unit purpose, engagement potential, and overall affect of the unit.

In order to understand how and what the teacher learned from the co-design and enactment of the lessons, the project design included detailed notes of all development meetings, videotape of all classroom sessions, after-class debriefing sessions among the design team and Mr. V., and teacher interviews. In addition, the project included observation and videotape of three classroom sessions from a different curriculum unit not developed by the design team and conducted by Mr. V. after enactment of the water unit. These observations provided opportunity to investigate whether or not Mr. V. made changes in his practice as a result of participating in the design and enactment of the water unit lessons. Analysis of these data provided insight into how and what Mr. V. learned from participating with the curriculum materials. In this project, the focus of teacher learning centered on what Mr. V. learned about using and facilitating student small group discussions to build student understanding of science concepts and the nature of science (Driver, Newton, & Osbourne, 2000; Sharma & Anderson, 2003).

Data & Discussion

The results of the analysis of student co-generative dialogues, student work, and student interviews show that students have critical and constructive perspectives to offer curriculum designers and teachers about what makes a lesson engaging and motivating. For example, students provided insight into how well the materials established a motivating context. They commented that the real-world situations presented in the materials made them think about how science concepts connect to their own lives. Students also offered ideas for making the lessons more successful by suggesting that the developers break group activities into smaller tasks; mix group work and individual work, and provide variety in the format of written lesson materials. Overall, students expressed that they liked the opportunity to work with others on model-building and model-based reasoning activities because they had not had opportunities to engage

in such activities in the past. They liked testing their own ideas, developing their own explanations, and claimed that working in small groups made science class more interesting. Based on the analysis of these co-generative dialogue sessions, classroom videos, and student work and interviews, the development team is currently revising the lessons to include more opportunities for students to develop the skills necessary to participate effectively in small groups, learn from evidence and reasoning, and read and interpret maps and models. Also, the developers will consider how Mr. V., students, and materials can co-construct learning environments conducive to supporting student conversations and small group interactions.

Findings about how and what Mr. V. learned from using small group discussions and the design and enactment of the lessons show that Mr. V. demonstrated increasing understanding of the value of small group conversations in helping students construct understanding. Interviews and teacher comments during design meetings indicate that prior to participating in the design and enactment of the water unit, Mr. V. did not use small group activities to facilitate student social construction of science ideas.

> For one thing, I hadn't done as much group work. I think I was afraid of doing very much group work. Well, the kind of group work I did was where they would work on a project. They would make a model or laboratory type stuff. But in terms of actually discussing things, ideas and things like that, I never had done much of that.

However, during the enactment, Mr. V. showed increased comfort and flexibility in providing opportunities for and facilitating student small group activities and discussions. For example, at one point during stage two of the enactment, Mr. V. and university researchers realized that the activities as enacted had not helped the students develop the robust understanding of a watershed necessary for them to proceed to the next activities. Mr. V. volunteered to develop an additional lesson for the following day. The university researchers did not have input into the format of this lesson. The lesson that Mr. V. developed and enacted the next day relied heavily on student group work and small group conversations to explore further the concept of a watershed as applied to specific water pollution cases. During interviews and after-class debriefing sessions, Mr. V. expressed growing awareness of the benefits of student small group discussions for developing understanding and expressed the desire to use more small-group conversations in his future practice. He identified specific situations in his future teaching where student small group discussions would be beneficial for enhancing student learning. Additionally, he recognized that he needed to introduce small group discussions into his science classroom early in the school year.

> And I'm sure, now last year I am sure I started out with a journal, like what you know, something about life, what is living things. But next year, I think what I'll do is get them into groups right off the bat the second day where they don't know anybody. I'll put some critters on the table and have them in a group, you know, why are these things alive, why are they different from you know, why are they alive and this crystal isn't, and stuff like that.

Observations of the post-water unit classroom sessions, however, revealed that Mr. V. did not immediately change his practice to include more opportunities for small group discussions. These initial findings suggest that as a result of developing and enacting the curriculum materials, Mr. V. learned that small group discussions can facilitate construction of student understanding, yet he is likely to use small group discussions only when he perceives that his established practice needs improvement or his students are capable of handling the challenge of doing group work and will benefit from it.. These two quotes followed each other in a conversation about using small groups more in his practice.

> I don't know at this point how much I'm gong to be able to do, but I am rethinking, even in biology, which I am doing right now,….. Some of the things I can't change very much.
>
> The group, the small group, you know interaction combined with whole class discussion. I think the biology students, I think it will really be good in biology. Because you have got some really great kids in there. You got the whole range in there and when you set up your groups, I think it will go really well in biology.

If Mr. V. perceives that students are developing understanding without engaging in small group discussions, or if he perceives that he doesn't have a group of students who will benefit from working in groups, he will be less likely to change his practice to include more small group discussions.

Teachers are not likely to make changes to practice unless they judge them to be necessary or desirable, or if they are have opportunities to discuss change and to learn from others (Appleton & Asoko, 1996; Arora, Kean, & Anthony, 2000; Franke, Carpenter, Fennema, Ansell, & Behrend, 1998).

This small study of a curriculum design case illustrates how including student co-generative dialogue and including a classroom teacher as a co-designer within the project can enhance the traditional design, implementation, and evaluation approach to curriculum development. While this curriculum design project followed many of the procedures and theoretical principles of the backwards design model, including developing learning goals to guide the curriculum development process, the inclusion of the strategies discussed in this paper provided space for student and teacher voices in the development process.

Benefits of Including Student and Teacher Voices

The inclusion of student voices in the design process acknowledges the role of students in the co-construction of the enacted curriculum. Their voice helps guide the curriculum developers in revision of the materials to better enhance the motivational aspect of the overall unit. Furthermore, the inclusion of student co-generative dialogues helps the curriculum development team, including the classroom teacher, understand the perspectives, needs, and values of the students for whom the materials are being developed. In the typical design process, these data might not be collected directly and may not often be utilized in the revision process. Finally,

during enactment, the teacher has the benefit of direct student input to guide the classroom enactment of the curriculum materials.

The inclusion of a classroom teacher as a member of the design team provided several important benefits to both the design of the curriculum materials and teacher learning. First, the teacher served as an important generator and judge of ideas that would not have been otherwise available in the design process (Connelly & Ben-Peretz, 1996). The design team was able to develop materials that better met the teacher's needs during the initial phase of the design process. Secondly, the teacher was better prepared to implement the materials and understood the intent of the materials during enactment. He had an understanding of the intent of the materials and the larger context behind the curriculum materials design. As a result, he was probably more likely than many teachers to implement the materials as written.

> You could come to me, with it all set and say here is what you would do. But it would be much much harder to get it done. I knew what we were trying to do.

In addition, the university researchers were able to understand better how teachers might engage with the materials during enactment. Mr. V.'s input during the design and writing phase of the development process guided the curriculum development team in the writing of the lessons. This input also provided context in which to consider Mr. V.'s enactment of the lessons. For example, prior to enactments, the university researchers knew Mr. V. expected to utilize student discussions to teach for understanding, which allowed them to pay particular attention to how he enacted this aspect of the curriculum materials. Finally, the university researchers learned better how the materials could support teachers learning to use the reform-type features included in the materials, including the use of student conversations to teach for understanding.

Teachers as the co-designers of the enacted curriculum require robust materials that can support their own learning of the important features of the instructional approach. However, in order to build such materials, curriculum designers need to understand how teachers engage with the materials and change as a result of their interactions with the materials. While the nature of this learning will vary depending on the context of the curriculum design project and the participants involved, experiences with this case illustrate that inclusion of a classroom teacher as a member of the design team can provide all members of the design team with a richer understanding of the nature of teacher engagement and learning from the materials than might otherwise be possible in the traditional design process.

Commentary for Curriculum Designers

After reflecting on the approach taken in this study, two of the researchers engaged in critical and reflective conversation about the Water Unit and the revision process. Understanding also that the revision of curriculum materials is a process in and of itself, the researchers felt it was necessary to provide some additional insights about the curriculum design process for curriculum developers. Thus this section is intended to engage those interested in curriculum development around a specific focus that emerged from engagement in this exploratory laboratory of curriculum design.

The approach the researchers took in this study was to consider students and teachers as partners in the design of the enacted curriculum. In this project, both students and teachers were not seen in their traditional role as the receivers of the intended curriculum, but rather functioned as potential evaluators and critics of the curriculum. We found this collaboration to be important in informing our exploratory, laboratory learning. Specifically, three connected elements of learning from the laboratory context were a focus on changing roles for curriculum development, using small group discussions for both student and teacher learning, and the emerging value of an emphasis on the nature of science for science curriculum materials. These elements of learning are connected to an integration of theory, practice, and research for curriculum development.

In theory, the curriculum development process deviated from the traditional by engaging teachers, students, and university researchers in the design and enactment of the unit. In practice, the teacher designed and implemented the unit, not adhering to the more traditional view of teachers as more comfortable adapting the implementation of materials rather than viewing themselves as critical users and co-designers of curriculum. He participated in debriefing sessions which were focused on improvement of teaching and curriculum materials. Similarly, students provided additional information regarding interaction and experiences with the materials, motivation in learning, and instructional supports. In research, the university researchers worked very closely with the teacher and students in the enactment and post-enactment of the unit. This was also done in a non-traditional sense. As curriculum designers, the university researchers were not the sole creators of materials; we were partners with teachers in the design of the enacted curriculum, and were in collaboration with the students as critics and evaluators of the materials. In all instances, these non-traditional roles and approaches for curriculum development all involved shifts in thinking about the design of materials and a focus on the development, enactment, and revision of science curriculum materials that were engaging, motivating, and inclusive of every voice in the process.

With each person contributing to the process, we were able to critique the materials for revision in terms of pedagogical supports and understanding the nature of science. As curriculum designers we found this aspect of the curriculum development process to be integral for the revision process and our thinking of ways to make curriculum materials meet the needs of teachers, students, and the local context. Everyone contributed something meaningful.

Specifically, the information gathered from Mr. V on the use of small group discussion revealed that he believed this to be a beneficial method of instruction. He was able use small group discussion within the guides of the Water Unit; however, he did not maintain this on his own. From students' critique of the lessons, we gathered some important information regarding naïve conceptions about the nature of science and the place of talk and discussion in the science classroom. Students saw science as an individual activity where scientists did not talk in groups and did not discuss their ideas. From a closer examination of the unit, the enactment, and post-enactment discussions, we learned that the nature of science was not evident in the materials and not explicitly taught by the teacher. The materials also did not help students realize the importance of talk and discussion in the science classroom nor in promoting this as an essential element for teacher learning. Perhaps this is a reason to explain why Mr. V. did not change his practice to include more small group discussions. This is related to research findings in helping

teachers to internalize the instructional importance of the nature of science and in changing their practice (Abd-El-Khalick, Bell, & Lederman, 1998; Gess-Newsome & Lederman, 1993; Lederman, 1999). Science teachers themselves hold naïve ideas of the nature of science (Akerson, Abd-El-Khalick, & Lederman, 2000), and thus without knowing his own views, nor understanding that an explicit focus on the nature of science will help with student understanding and engagement in classroom talk, Mr. V. was less likely to make changes to his practice and to see small group discussion as vitally important in the science classroom. With this information, the revision process must consider ways to include in science curriculum materials a connection to the nature of science, to helping students and teachers to understand this in the context of model-based activities and small group discussions. Especially important is the idea that science is a social process, where there is the social construction of scientific ideas (National Research Council, 1996). Science curriculum designers must design curriculum materials in such a way that they attend to the nature of science with instructional practices that enhance both student and teacher learning around this idea.

Conclusions

The design of *Water for People and the Planet* was intended to be a learning experience for future curriculum materials designers. Designing curriculum materials that are rigorous enough to support teacher co-construction of the enacted curriculum requires that curriculum developers adapt to changing roles. They will involve curriculum developers in understanding student motivations, teacher engagement, teacher learning from materials, and the nature of science. The inclusion of student and teacher voices in the curriculum design process served as an opportunity to explore aspects of student engagement, teacher thinking, and teacher learning in the context of a curriculum unit designed to meet the needs of diverse students in a local setting. The data collected during the student co-generative dialogues and the analysis of teacher learning are currently guiding the revision of the second generation of these curriculum materials. Attention to making more explicit the nature of science, understanding the importance of small group discussion, and expanding notions of doing and thinking science is considered to be important in the revision process.

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