

## **METHODS OF SMILE: A SCIENCE SEMINAR COURSE IN “DELIBERATE EDUCATION”**

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### **Abstract**

Oregon State University’s Science and Math Investigative Learning Experiences (SMILE) Program is an enrichment program for minority and underrepresented K-12 students. Through an eight-year iterative process, SMILE has developed and refined a science seminar course that allows undergraduate and master’s degree students to explore science enrichment for youth. Students enrolled in the course are engaged in teaching and learning as a community of learners with a focus on service learning. The intended audience for the course is those students who are interested in working in educational settings with youth—as classroom teachers, science/mathematics professionals engaged in precollege outreach, and the like. The actual audience, though quite broad, represents those students who want to be better prepared as effective science educators in their various career roles. This article provides the context for the course, defines and examines “deliberate education” as illustrated by the structure and activities of the Methods of SMILE seminar course, highlights the elements of an effective community of learners as demonstrated through it, details the specific strategies and activities of it, and summarizes the next steps in identifying its impact in transforming the participants’ college experiences.

### **Introduction**

In reflecting on the Program’s experiences in providing programs for students in grades 4-12, program staff became increasingly aware of the key role of college students in the higher education connections for precollege youth. This has been particularly true during the on-campus challenge events for precollege students. In providing an experience through which college students interacted with and supported the engagement and success of precollege youth, program staff became further aware of the wonderful quality of the experience, both for the precollege students and the college students supporting them.

Through the context of academic enrichment in math and science, the Science and Math Investigative Learning Experiences (SMILE) Program at Oregon State University has developed a model that nurtures the college preparation and entrance of underrepresented minority and other

underserved students participating in its after school clubs. The model offers a deliberate and delicate weaving of student experiences, participant and provider attitudes, and program, club, and community traditions. The structure of activities is one that: enriches the students' support networks of families, schools, and communities; addresses the students' perceived barriers to academic success; influences students' choices; and, offers academic learning opportunities. The outcomes and evaluations of SMILE programming have shown that through their SMILE Club participation, students more readily and more capably find reasons to persist and attain in school, and develop broader visions of their future.

In a 1999 report, the National Task Force for Minority High Achievement (NTFMHA) addressed five factors that have been found to strongly influence educational outcomes for students of different groups: 1) economic circumstances; 2) level of parents' education; 3) racial and ethnic prejudice and discrimination; 4) cultural attributes of the home, community, and school; and, 5) quality, amount, and uses of school resources [1]. Along with these real influences are students' perceived barriers to their academic success and educational attainment, their self-efficacy beliefs, and their outcome expectations [2]. NTFMHA concludes its report with a recommendation for a commitment to affirmative development from diverse public and private sector partners.

These research findings inform SMILE's efforts to address the achievement differences among students from diverse groups. The SMILE Program serves ethnic minority, low-income, and rural students—students underserved in traditional educational settings and underrepresented in higher education, most notably in science, mathematics, engineering, and the biomedical majors and careers. A number of factors influence program design and activities: promoting membership in a safe, supportive community; fostering the development and use of life skills, highlighting the role and use of tools and strategies to aid persistence; enriching students' intrinsic resources; minimizing extrinsic barriers for students; strengthening resiliency of youth; and, capturing vivid visions for youths' academic possibilities.

In helping precollege students build their academic visions, program design includes an annual college-connection challenge event. College student mentors are essential to the success of these events. The need to support them in their roles with the SMILE Program led to a unique science seminar course. An underlying question in the development of the course was: What role might university students play in helping to make academic content exciting, higher

education visible and accessible, and career options viable and personal for precollege students? In their study of a project funded through the National Science Foundation to place graduate and advanced undergraduate students in high school science classrooms, Trautman, Avery, Krasny, and Cunningham shared the observed and real, non-academic benefits of having the university students serve as role models for the high school students, communicate an infectious excitement about science, and present the picture that scientists are people as real as the precollege students themselves [3]. With a similar intent, the *Methods of SMILE* seminar course was designed to develop a cohort of students who have reflected on science teaching and learning, their own roles as science educators, and the implications of deliberate education. These students are then prepared to incorporate many of the course elements in their future roles as classroom teachers and science educators in a variety of other settings.

To support the early field experiences of elementary education majors or master's of arts in teaching students, the Oregon Collaborative for Excellence in the Preparation of Teachers (OCEPT) provided funding for eligible seminar participants to serve in the dual roles of instructors and counselors at the Outdoor Science Adventure for elementary SMILE students, a field-based college connection event designed for academic enrichment and mentoring. Later, author Collay, as the course instructor, was selected as an OCEPT fellow, supporting SMILE's involvement in statewide efforts to impact the preparation of science and mathematics teachers. Substantive, ongoing support in the field is a critical element in the retention of classroom teachers [4]. Given this context, how does a seminar course in deliberate science education fit into a broader teacher education agenda?

### **Deliberate Education**

Education may have both explicit curriculum outcomes and implicit, hidden outcomes. Each year in preparing for the *Methods of SMILE* seminar course, the authors and, then, co-instructors of the seminar, had numerous discussions and strategizing sessions on how best to address the explicit outcomes of the course and anticipate and reveal the unintended outcomes. The effects of the hidden curriculum, often influenced by a classroom teacher's behaviors, have been intensely studied and have been shown to put in place barriers that hinder the academic achievement and educational attainment of significant numbers and groups of students [5-7]. As they addressed the need for a broader agenda in school reform, Battistich, Watson, Solomon, Lewis, and Schaps spoke to the danger of relegating some non-academic to the hidden curriculum

[8]. Such a focus could result in students' developing attitudes, skills, and orientations that subvert students' needed development as responsible citizens.

Establishing a teaching and learning environment that nurtures successful experiences for teachers and students requires two critical elements: having clearly defined outcomes and striving to have them realized by each participant; and, implementing and acting on the results of various assessment strategies designed to inform practice and indicate progress toward the realization of outcomes. The authors realized that their own process in considering, adopting, and refining course methods represented significant outcomes for the seminar's participants—those of recognizing and striving to understand the unintended outcomes in a teaching and learning environment; making choices to change those outcomes; and, being deliberate in providing supportive and relevant experiences that address students' long-term goals as well as their short-term outcomes.

The authors began to use the phrase *deliberate education* to signify the intentional and careful attention that they were giving to: (a) fostering the participation and successful engagement of learners by planning for and designing around the desired outcomes; (b) developing multiple strategies for assessing the various learning experiences, the short- and long-term outcomes, and their demonstrated efficacy; and, (c) gaining and employing skills in reflecting on processes and personal efficacy, intentions, and behaviors. Choosing to be a deliberate science educator requires one to recognize that enthusiasm and personal interest in science content alone is not enough to successfully engage students in that science [7]. Effective deliberate science educators will strive to help all students feel comfortable with and connected to science [7]. In general, the goal of deliberate education is to make education matter to all students—to give education a personal, cultural, and real-world context and thus establish a base for literacy and competence.

Deliberate education in the SMILE Program is premised on the disparity in the learning opportunities and the widening achievement gaps among different student groups, especially in the areas of mathematics and science. According to a report from the National Center for Education Statistics, “the values, beliefs, perceptions, and attitudes the students themselves hold regarding mathematics, science and engineering subjects and related careers differ across gender and race/ethnicity.” [9] The report also showed gender differences in self-perceived ability and persistence, with young women persisting less and having lower self-perceived ability. Within

this context, deliberate education in action requires that teachers and other education providers carefully consider how to create learning opportunities that both improve young women's self-image and self-efficacy in relation to math and science and also prepare them for careers in these areas.

### **Content in a Context of Community**

One of the most powerful elements for the seminar course is implementing tools that help build a community of learners. Creating community and fostering a sense of membership is a way to provide a place where learning is fun, where opportunities abound for community members to engage in higher order thinking and problem solving, and where members have the freedom and encouragement to participate in nonthreatening ways [10]. Building a caring community is essential if educators hope to eliminate the unintended outcomes of reinforcing low self-efficacy and/or self-image, and aiding low levels of students' intrinsic motivation to learn.

A community of learners is an environment in which members are able to make connections, share resources, bring and receive support, create innovations, and build new collaborations. In any community, members have defined and revealed roles, build a foundation for common understanding, and establish shared goals. In the community, the shared goals include supporting and fostering learning, working as a collaborative team to facilitate the work and accomplishments of individuals and the team, accepting each other's foibles with patience, and honoring each other's accomplishments with accolades. It is important for educators to understand that academic achievement is impacted by the social-emotional factors connected to family, school, and the larger community [11]. Any person hoping to positively influence the lives of students will best optimize their impact by understanding interplay of these social-emotional factors and the larger community on students' academic visions and achievements, as well as their educational attainment.

How does one develop and foster shared goals even as the roles in the community are being defined? Can the experiences for the participants be structured so that each feels comfortable in the process of forming community and supported by the community's participants? The goals of the community, the context and the content to be explored can be supplanted by the process if care is not taken to ensure that participants are engaged and buy into the values and central tenet of the community. Purposeful intent is needed to help participants develop a sense of place, support, and inclusion in a community [12]. Outcomes of an island

experience used to build collaboration and community among future school counselors revealed that the hands-on learning actually addressed the overarching goals of the program. These goals included: (a) building consensus, cohesiveness, and a sense of community among all attendees; (b) encouraging everyone impacting students to work systemically; and, (c) harnessing this collaborative energy and spirit to further the aims of the comprehensive program [13]. The SMILE Program places great value on the need for, the efforts required to realize, and the benefits of building community among all of its program's constituents, including the students in the science seminar course. The remainder of this article is devoted to sharing how the design of the course shows a deliberate blending of program mission, research, and the growing program vision for enriching the college student experience.

### ***The Methods of SMILE Seminar Course***

At the beginning of each year's seminar course, participants learn about each other's skills, backgrounds, and interests. In fact, "affirming identity is not contradictory to, but rather a prerequisite for building community." [14] A favorite seminar activity is one that emphasizes that the course will be different, and who the participants are and what they bring to the course matter. During the "Nonverbal Interviews" opening activity, students are asked to form pairs, share a large piece of poster paper, and introduce themselves through drawings (without using letters or numbers). Students work for ten to fifteen minutes to create their drawings using crayons, markers, and colored pencils. At the end of this time, within each pair, students exchange drawings and spend five minutes looking at and "interpreting" their partner's drawing. Again, this happens while students are restricted from talking. Finally, each pair of students stands in front of the larger group and, using each other's drawing, introduces each other. While this could be a very uncomfortable and risky activity, the participants are encouraged to participate and are reassured that at the end of each pair's introductions, the members of the pair will have the opportunity to correct any misinterpreted information. Consistently, class members find the activity fun and quite different. The course instructors continue to use the activity because it sends a number of important messages that recur throughout the course.

First, the activity is challenging to do! Students find it hard to distill who they are through drawings without words. It is a further challenge for someone else to decipher these drawings and, based on that information, stand in front of a group of mostly unfamiliar faces and introduce someone you've just met. Although the activity provokes discomfort among the students, the role of the activity in building a sense of community in the class helps make each

person's participation matter. It is also a very different introduction from what one might otherwise say when asked, "Who are you?" The participants share much more about family, birthplace, religion, hobbies, skills, and interests than one might expect. Each drawing paints a very vivid picture of the participant, and the activity forms a common and challenging experience shared by them all.

At this point course instructors share the purpose and objectives of the seminar course. The purpose of the *Methods of SMILE* seminar course is to develop a diverse population of qualified and interested college students who are committed to expanding their skills in and appreciation for teaching and learning and who may choose to work with the SMILE Program in its education and outreach activities in the local community. Specific course objectives include:

- Promoting awareness of the issues impacting education of rural and minority youth
- Fostering the development of community building skills
- Encouraging awareness of social issues surrounding the diversity of cultural and ethnic groups in the United States
- Investigating the role of modeling as a teacher and lifelong learner in the educational setting
- Providing a forum through which students may absorb, analyze and synthesize ideas relating to science teaching using a multicultural education approach
- Providing an arena for students to develop science teaching strategies to address diverse ways of learning
- Providing opportunities for developing skills in science curriculum creation addressing the issues of diversity
- Modeling the SMILE approach to education

Specific strategies used by course instructors, in addition to building community are: (a) practicing communication skills and science teaching strategies that reflect overall course objectives; (b) modeling pedagogical strategies that promote learning for diverse learners; and, (c) allowing flexibility in teaching to address students' needs.

Another central tenet of the course is the use of various strategies to share information. The students' first class paper is the "Student Information" sheet. This form is structured to

provide basic contact information, as well as elicit from students their reasons for taking the course, the experiences they bring to the community, and most importantly, the outcomes they hope to realize through the course. The instructors read these and begin course modification to ensure that the course reflects those things the students say they want to learn, while maintaining the intent and integrity of the course.

Seminar participants are expected to be reflective practitioners, and the instructors model the strategies, share writings and readings, and provide support and encouragement to help students develop their skills in this area. This mentoring is seen as a key element in helping novice reflective practitioners move through the developmental process [15]. Students are asked for specific reflections in two ways. They reflect on the implications of the course readings and the experiences in which they are engaged on how they may choose to relate to youth as science educators. In addition, students are asked to reflect on their ideas about learning and learners, and how these ideas might shape their practice as science educators. As the course progresses to week five and again to week nine, students participate in outreach events at two local elementary schools. These family nights give students opportunities to try out science activities, explore their roles as science educators doing outreach, and provide a service for and make a connection with community members. In a supportive atmosphere, students apply what they have been engaged in throughout the course.

## **Evaluation**

A realization of the synergistic interaction of evaluation and program design is embedded in the *Methods of SMILE* seminar course. Instructors consciously and consistently ask about and reflect on each class. Each discussion and reflection provides a piece of the puzzle that examines the effectiveness and impact of course format and experiences. The course goals and instructor flexibility make it possible to make changes in what was planned and how the class unfolds during the evening. When it becomes clear during the two hours that objectives are not being met and/or materials are not sufficient for the next step, the deliberate educator assesses the points of disconnect and embarks on a different path, using different strategies and materials to help participants achieve the desired outcomes.

An example is taken from the preparation for the first outreach presentation. The class members work through each of the activities they will teach at the Family Math and Science Night. Knowing that the focus of the event is engaging students and their families in fun math

and science activities, students need to understand the logistics and feel competent in the content of each activity and recognize that a course outcome for them is focusing on the process of teaching. Sometimes it becomes apparent that seminar participants have had fun in planning and rehearsing the activities and learned about the intent of and goals for the event, but they have spent little, if any, time reflecting on the teaching. Through a combination of discussion and questions, instructors are able to help students refocus on their practice as educators and guide them through formulating questions to ensure that the event addresses the community members being served and the college student participants as they define themselves as deliberate science educators.

The final presentation is an evening of evaluation. Students present their final class projects in the context of a desert potluck; food, as a powerful social messenger, helps set the stage for community closure. Students prepare and deliver their final projects. Students are asked to create and present a five-minute program on what they learned from the class. They can present it in any fashion they choose, from art to readings, to activities to songs. Students have chosen a wide range of strategies and styles to use over the years. What is clear is that the students feel supported in their own process by the structure and by other class members. Class members are encouraged to write notes about each presentation; they share these at the end of all presentations. Each presenter receives the notes written by others to know that she or he has contributed to the community and impacted the lives of the other members. While a number of presentations stand out, all of them represent the students' personal reflections on a process and their own journey into teaching and learning.

At the end of the evening, they fill out both the SMILE-designed evaluation and the Department of Biology evaluation. From the students' written comments, themes have emerged. The class is one of a kind. Students state it is hard for them to compare their experiences in the SMILE seminar course to those in their other courses because of the stark differences in format, goals, and student involvement and engagement. Students often rate the course as one of the best of their college experience. The factors that support their responses include purposeful attention to creating a sense of community, the team-based approach to their hands-on learning, and real evidence of affirming and valuing each participant. These responses make it clear that the seminar participants have been engaged in a learning environment that was supportive, inclusive, challenging, and enriching.

The course has influence consistent with its design. A number of seminar participants have made career decisions based on their experiences of being in the course and working with the SMILE Program in its activities for club members. One science major, working on his master's degree, took the class because a friend brought him along. The student then worked for the SMILE elementary outdoor science camp and decided that his calling in life was to teach young people. Soon after, he enrolled in an MAT program and is now a middle school science teacher.

Another seminar participant served in numerous roles with SMILE—resident advisor for three middle school summer science camps, instructor/counselor for four elementary camps, and team mentor for several on-campus events for middle and high school students. After completing her degree in environmental science, she realized that her long-term volunteering with SMILE was her attempt to address her desire to be integrally involved in the education of youth. She made a career change. She entered and completed an MAT program, became a fourth grade teacher, and served as an elementary SMILE Club advisor. She has since transferred from the district with the SMILE partnership, but she is still a classroom teacher.

### **The Next Steps**

As researchers did for the Science Outreach Program at George Fox University, the *Methods of SMILE* instructors need to conduct further action research “to document, analyze, and interpret the experiences of the participants” in the seminar [16]. On a longer time scale, an important question to ask is what students perceive as the influences from the course that persist in their careers as teachers and science educators, and their views about and efforts to build community where they live and work.

One of the desired outcomes for the course is to encourage students of color to take the class and, hopefully, get involved with SMILE activities. While some minority students participate, they have never emerged as a majority of seminar participants. Effort and attention are needed to look at the reasons the participation of minority students is so low. Pat Gurin, a social psychologist, found that students who experience the most racial and ethnic diversity in and out of their classrooms showed the greatest engagement in active thinking processes, growth in intellectual engagement and motivation, and growth in intellectual and academic skills [14]. How might the participation of minority students be increased so that the full benefits of engagement in a diverse community are realized for all seminar participants?

With the emphasis on science education reform and the call for greater collaboration between university science faculty and teacher education faculty, what role does a seminar course in deliberate science education play? [17] How might this seminar course become a more integral partner in institutional efforts to build stronger science teacher education collaborations, provide education outreach experiences for science majors, and promote a lifelong value for and commitment to science education and outreach? Is it possible to make a definite link between the nontraditional content and strategies of the *Methods of SMILE* seminar course and the academic benefits attributable to service learning? [18] The responses of the participants in the seminar warrant finding ways to address these questions and build a case and established place for the SMILE course in focused efforts to redesign teacher education at Oregon State University. ■

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