Developing Culturally Responsive Teaching Through Learner-Centered Teaching During Content and Field Immersions

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Developing Culturally Responsive Teaching Through Learner-Centered Teaching During Content and Field Immersions

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Abstract: Using a mixed methodology, we followed the preparation of fifteen teacher candidates through a summer content immersion and schoolyard ecology field experience as part of their alternative route to teacher certification program. The primary purpose of our summer project was to support and learn from the funds of knowledge of the teacher candidates and migrant youth. Next we sought to determine if a learner-centered teaching, modeled in a content immersion that explored the inner life of cells, could be applied heuristically to co-plan and teach schoolyard ecology. The results suggest that a learner-centered teaching translates well between content and field immersions and can positively support the cultural and community wealth of both candidates and migrant youth while affirming and deepening our appreciation of the local natural world.

Keywords: culturally, responsive, learner-centered, alternative, route, teaching
INTRODUCTION

If we are to preserve a habitable planet our children need teachers who understand science and ecological principles in relation to critical issues of sustainability and social justice. (Orr, 2004). Yet, in an increasingly urban landscape children often lack the opportunity to explore and learn about the natural environment right outside their classrooms (Louv, 2005; Pyle, 2002). Children growing up in migrant families are no exception. They may live close to the land and have families that work the land intimately but still may not have the opportunity to share and refine their knowledge through exploration of their own schoolyards. In addition, the children’s teachers may be more comfortable teaching inside a classroom than taking their students to the open schoolyard.

In this paper, we describe the development of a learning community focused on culturally responsive teaching that bridges indoor and outdoor settings. Our diverse group of teacher candidates, university instructors and elementary students came together during a summer alternative route program designed to help prepare a group of 15 elementary teacher candidates for science inquiry. As instructors, we first modeled learner-centered practices during a campus-based cell biology unit. We then sought to support the transfer of these learner-centered approaches as teacher candidates guided elementary students in a focused exploration of their schoolyard. According to Weimer (2013, p. 15), learner-centered teaching engages students collaboratively in the “hard, messy work of learning” through explicit skill instruction and directed reflection.

The focus on schoolyard ecology was intentionally chosen to link ecological principles with sustainability and to align with the cultural assets of the elementary students in the Migrant Youth Academy (MYA). The MYA is an annual summer event that supports migrant youth in developing their English language literacy and school-based academic skills. As we began our summer work together it was clear that the bilingual teacher candidates and their students possessed a wealth of culturally derived knowledge and skills that supported a healthy and high functioning school community. Moll et al. (1992, p. 133) describes this “historically accumulated and culturally developed knowledge and skills” as funds of knowledge.

Two linked questions guided our summer program design:

1. How do we support and learn from the funds of knowledge of the teacher candidates and their students while growing ourselves as culturally responsive teachers?
2. How can learner-centered teaching, modeled in a content immersion and applied while teaching field ecology begin to change teacher candidate’s beliefs about teaching and learning?

During the summer program, we attempted to support and learn from the funds of knowledge of the teacher candidates and their students while growing ourselves as culturally responsive teachers. We purposely integrated culturally responsive teaching strategies when designing the summer learning experiences including: learner-centered practices, communicating high
expectations, learning within the context of culture, creating positive perspectives on parents and families, modeling teacher as facilitator and building culturally mediated instruction ("Culturally Responsive Teaching," 2017). As we attempted to more directly value students’ backgrounds and cultural experiences, we also attempted to develop a more culturally responsive research agenda.

**Description of Alternative Route Program**

As early as 2001, the Washington State legislature began funding Alternative Route teacher education programs that offer a residency model for targeted populations in which candidates learn to teach while teaching. This funding stimulated new partnerships between school districts and teacher preparation programs. Alternative-route certification programs are designed to provide access for teacher candidates who would not be able to complete a traditional route to college graduation and teacher certification. In 2014, the first cohort of Western Washington University’s (WWU) *Pathways to Teaching (PTT)* began their 2-year alternative route to teacher certification. PTT was designed to support working paraeducators to become certified k-8 Elementary teachers with an English Language Learner (ELL)/Bilingual Endorsement. ELL specialists work with students who are learning to speak, read and write English.

**Description of Migrant Youth Academy**

Hosted at a local k-8 school, the MYA supports migrant youth in developing their English language literacy and school-based academic skills in subjects like math and science. Learning groups of 10-15 MYA students spend the morning focused on literacy activities led by certified teachers followed by the outdoor schoolyard ecology in the afternoons. The elementary students ranged from Pre-kindergarten through rising 6th graders and were grouped in grade bands.

**Description of Teacher Candidates and Instructors**

In culturally responsive research both the lives of participants and researchers are essential in the research design (Berryman et al., 2013). Here we briefly introduce both the teacher candidates and ourselves. Of the 15 teacher candidates recruited for PTT, 11 are bilingual, 10 Latinx, and nearly all are first generation college students. The teacher candidates have between 3 to 16 years of experience in classrooms and represent 6 school districts in varied roles as instructional assistants. Because the teacher candidates continue to work in the communities that they live, their culturally derived *funds of knowledge* are local and extensive.

As instructors, we are white, monolingual teachers at a university known as a sustainable green campus. Our summer science teaching team includes two women graduate students in biology education and a male professor of secondary education and science education. As second and third generation college students, we have all had recent professional positions before teaching including environmental education, military service and green building design. We have 3 to 15 years teaching experience. Because we are summer visitors to the k-8 school, we attempt to remain learners that are responsive to the teacher candidates’ funds of knowledge. Our goal is to minimize our roles as content experts, so we might get to know the teacher candidates, tapping their prior experiences and facilitating the integration of their rich cultural and cognitive resources into the classroom and field study. As researchers, we sought also, to challenge our positivist approach and objective stances. We hope to create a place of co-inquiry where we learn together.
Thus, from the beginning of the program, a tensional balance was felt between the roles of teacher as expert/researcher and teacher as learner. We hoped to grow as culturally responsive teachers, pushing toward roles as facilitators. According to Ladson-Billings (1994), culturally responsive teachers respect and acknowledge the value of their students’ cultural references in every aspect of the learning process. Therefore, it is essential that teachers relate the content to the cultural backgrounds of their students (Wlodkowski & Ginsberg, 1995). Our aim was to respect our student’s cultural integrity while engaging learners in a pedagogy that crossed disciplines and cultures.

**Content Immersion: The Inner Life of Cells**
The summer program consisted of an initial content immersion at WWU in which candidates experienced an inquiry-based science curriculum centered on Investigating the Flow of Matter and Energy in Living Systems. Patterned after the successful *Physics and Everyday Thinking* (PET) curriculum, the life systems curriculum is designed for a 10 to 15 week term and is a required course for all elementary education majors at WWU (Donovan et al., 2013). As content facilitators, we selected a one-week section of the curriculum that was particularly well suited for our ELL teacher candidates because it utilizes a collaborative learner-centered pedagogy with a compelling content focus on *The Inner Life of Cells*. Research by Gay (2000) suggests that cooperative learning groups in which peer collaboration is the norm are a good match with the cultural systems of African, Asian, Native, and Latino American groups. Our Latinx/ELL teacher candidates were already familiar with collaboration and consensus building activities when learning challenging content in other disciplines such as literacy and math. In the summer session, they frequently demonstrated how effective their ELL strategies were as they worked to agree on a set of evidence-based biological ideas centered on living cells. Our hope was that as candidates learned to navigate within a curriculum aligned with Benchmarks for Science Literacy and the Next Generation Science Standards (NGSS), they would develop important life science concepts applied to cells, ecosystems and sustainability.

Some of the hallmarks of the learner-centered curricula include using prior knowledge to develop hypotheses, testing initial ideas with experiments and using evidence and logical reasoning to support new collaboratively derived ideas. Working in collaborative table groups, candidates begin with a key question that provides background and a focus for their learning. Next, a solicitation of initial ideas encourages students to individually commit their own thinking on paper before discussing their ideas with group members. In some instances, a whole class white-boarding activity helps even more ideas emerge from the students. Candidates flourished in this highly gregarious and collaborative space that honored student voice and validated provisional ideas. Candidates easily advanced their evidence-based reasoning strategies during table work and whole class discussions.

As developed in the similar PET curriculum, the *Learning About Learning* component of the life systems curriculum provides learning activities centered on the Nature of Science and the Next Generation Science practices. These activities are designed to help candidates become more aware of how their own biological ideas develop over time. For example, during a field trip to a local arboretum, candidates are asked a guiding question, “How do we study the connections between living and nonliving things?” As teacher candidates begin to collect natural objects in two categories, “Alive”, and “Nonliving”, they inevitably discover that detached leaves, bird
feathers, and butterfly wings challenge their understanding of what it means to be alive. The physical evidence compels candidates to create a third category, “Nonliving but once alive”. These classification considerations become essential pedagogical building blocks during specific labs on how cells function. Overtime, candidates learn to trust their own provisional thinking about the cellular basis of life. As they collect and assimilate additional evidence they refine their conceptual frameworks related to the inner lives of cells.

As instructors interested in culturally responsive teaching, we were consistently challenged to refine our roles as facilitators. As we interrogated our own identities as content experts, one instructor wrote, “Learning to listen and not “tell” is as challenging and ultimately satisfying as learning the intricacies of photosynthesis” (Burgess, Field notes, July 2, 2014). Learning to listen carefully to teacher candidates and ask questions to clarify our understanding of their ideas and learning styles became a central tenet of our summer work. Once the teacher candidates understood that the instructors were also there to learn, the community began to shift fluidly toward co-learning. For example, as our collaborative inquiry on the inner life of cells progressed, one of the table groups comprised of Latina candidates, began to formally teach the instructors how bilingual teacher candidates support each other to make sense of complex science text. They modeled specific ELL strategies such as reading aloud, color highlighting and annotation to help acquire the academic language of cell biology. By showing us how they learn best, we were better able to better support their learning in future activities. This mutualistic learning became a summer theme as the rich cultural and cognitive resources of the entire community became more integrated.

**Field Immersion: Schoolyard Ecology**

Following the weeklong content immersion, the teacher candidates worked collaboratively for several weeks in groups of three with their cooperating teachers, several faculty and two graduate students to prepare, teach and assess a one-week field immersion centered on schoolyard ecology for the students enrolled in the MYA. The plan was for each learning group of 10-15 students to spend the morning focused on indoor literacy activities followed by outdoor schoolyard ecology in the afternoons. The elementary students ranged from Pre-kindergarten through rising 6th graders and were grouped in grade bands.

By focusing collaboratively on the natural communities of the schoolyard, we hoped to extend, support and learn from the funds of knowledge and cultural community wealth of the candidates and their students. As working paraeducators, most of the teacher candidates grew up in the communities and schools they now serve. Many of candidate’s and the student’s families are integral members of the local agricultural communities and possess deep connections to the land and human communities of the rich agricultural valley. The juxtaposition of the open schoolyard to active vegetable, berry and bulb fields reminds us that many of the Migrant student’s families work these crops and are therefore deeply connected to the land and its fertility.

Because teacher candidates that are repeatedly taught science utilizing active learner-centered inquiry strategies are more likely to use the same strategies in their own teaching (McDermott, 2006), we intentionally spent two weeks before the MYA modeling additional field-based learning activities with the teacher candidates. Our evidence collecting activities included observation protocols, species inventory procedures, Science Notebook skills and photography
using iPads. Instructors also modeled teaching strategies such as “Each One Teach One”, a simple technique for imparting small pieces of understanding to a group—one student at a time. Our hope was that the learner-centered teaching modeled initially in the content immersion, would transfer from indoor to outdoor learning.

During the schoolyard ecology unit, teacher candidates led students through a guided inquiry exploration of the local environment around their elementary school. We knew that many of the students enrolled in the MYA were from migrant farming families and would have a strong foundation of place-based intimacy that we could build on. To emphasize a strong sense of place, we named the summer program “The World in Our Backyard” and asked two guiding questions of students: 1. What species live here and why? and, 2. What do they need to thrive?

To begin to answer these questions, teacher candidates led students in an exploration of six unique habitats around the margins of the extensive play yard. Each habitat was composed of different plant and animal communities. To support the field explorations of their “backyard” students were provided a field knapsack, water bottle, hand lens, notebook and pen. A variety of resources were available to aid students in their exploration, including: microscopes, field guides, plant presses, collection jars, increment borer to determine the age the trees, loups, dip nets, insect sweep nets and even iPads for the older students to take notes and photos. To support observations of “hard to see” animal life, insect pit traps were constructed at each site. Students were thrilled to examine the contents of the traps each day before releasing the beetles, spiders and isopods. All groups had the opportunity to explore each of the habitats in detail. We established a central room in the Elementary library that served as a supply room, research base and conferencing space. Midway through the week, students went on a field trip to a nearby marine and woodland environment to extend and apply their ecological explorations.

All student groups produced an artistic and informational field guide to their schoolyard. The creation of the field guides involved labeled illustrations, mapping skills, and the inclusion of regalia. Students enhanced their science communication skills through discussions, writing, and singing, chanting about what the experienced in the field. As students planned and carried out field investigations they asked questions, analyzed data and constructed explanations. During the field guide design work, they engaged in evidenced-based arguments and communicated their finding accurately and artistically.

METHOD
This research project employed a mixed methodology using four primary data sources: content assessments, a survey, instructor notes (i.e., observations and reflections) and teacher candidate’s reflections. Though our research design included positivist elements as represented in the survey and assessments, we also included more culturally responsive research conceptions such as self-interrogation found in instructor notes and collaborative planning expressed in instructor and teacher candidate’s reflections (Berryman, SooHoo, Orange, & Nevin, 2013).

**Content Assessments**
The specific content pre- and post-test was piloted during the previous summer during a professional development program for in-service teachers. The content assessment was
administered before the start of the first class and re-administered at the conclusion of the one-week content immersion.

**Surveys**
The Model of Research-based Education (MORE) Survey was administered before the start of the first class and was re-administered after the completion of the summer program. The MORE survey builds on three previously verified survey instruments and includes four targeted belief areas and as well as creating one novel target area (Ohana, Miller, & Hanley, 2013). The survey and the belief areas are summarized below in Figure 1.

**Instructor notes (Observations and Reflections)**
Throughout the summer instructors also made observations and documented their own lived experiences.

**Teacher candidate reflections**
Finally, throughout the program teacher candidates were given the opportunity to reflect in writing and through informal interviews.
## RESULTS

This study illustrates that a learner-centered teaching translates well between content and field immersions and can positively support the funds of knowledge of both candidates and migrant youth while affirming and deepening their appreciation of the local natural world in relation to sustainability. As instructors, we grew in terms of our understanding and ability to implement culturally competent teaching. Because two questions guided our summer inquiry, we will address each separately.

**Question 1:** How do we support and learn from the funds of knowledge of the teacher candidates and their students while growing ourselves as culturally responsive teachers?

Culturally responsive teaching demands that we consider the experiences and perspectives of ethnically diverse students as we design and implement learning experiences. We purposely

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**Figure 1.** Breakdown of targeted beliefs used in the MORE survey. The figure shows the instrument used for each targeted belief, the factor(s) contributing to that belief, and the number/type of questions.

<table>
<thead>
<tr>
<th>Targeted Beliefs</th>
<th>Instrument</th>
<th>Factors (# of items)</th>
<th>Items (total #, type)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beliefs about effective science instruction</strong></td>
<td>HRI Teacher Views about Science Instruction</td>
<td>-Learning-theory-aligned science instruction (11) -Confirmatory science instruction (7) -Hands-on over all else (3)</td>
<td>21 Likert items (SA to SD)</td>
</tr>
<tr>
<td><strong>Self-efficacy as a learner of science</strong></td>
<td>Colorado Learning Attitudes about Science Survey (CLASS)</td>
<td>-Personal interest (6) -Real world connection (4) -Problem solving confidence (4)</td>
<td>12 Likert items (SA to SD)</td>
</tr>
<tr>
<td><strong>Self-efficacy as a teacher of science</strong></td>
<td>Science Teaching Efficacy Belief Instrument-Preservice (STEBI-B)</td>
<td>-Personal science teaching efficacy belief (13)</td>
<td>9 Likert items with factor loadings and reliability coefficients above .50 (Q23 excluded due to vague/outdated language) (SA to SD)</td>
</tr>
<tr>
<td><strong>Beliefs about peer collaboration in learning science concepts</strong></td>
<td>Question constructed by MORE</td>
<td>Beliefs about peer collaboration in learning science concepts (1)</td>
<td>1 open-ended item</td>
</tr>
</tbody>
</table>
considered many of the aspects of culturally responsive teaching when designing the summer learning experiences. Though we grew in some dimensions of culturally responsive pedagogy, we remain entirely novices.

**Unburdening of the curriculum to focus on lived experience.** One way that we grew as culturally responsive teachers was through our use of learner-centered instruction. For example, as content facilitators, we considered many curricula for the summer content immersion before settling on *The Inner Life of Cells*. Because the breadth of biological topics covered in the curriculum is purposely limited to a concentrated coverage of cell biology, there is time to integrate a more learner-centered teaching. This unburdening of the curriculum also allowed us to create high expectations for our learners focused on just a few big ideas.

We also found that the content focus on Energy in Living System was quite compelling to teacher candidates who were able to make direct links to their own lived experiences as children growing up in families that supported the fertile agricultural fields. For example, with little encouragement, candidates were eager to share their observations of the natural world during daily warm up activity called *Noticings*. One of us would ask, “What did you notice on the way to school?” This was a chance to share observations from their short commutes, home surroundings or walk across campus. Because of this initial focus on the lived experiences of the teacher candidates it was easy to emphasize the cycles of nature e.g., blooming flowers, changes in leaves, and weather patterns. We found that when we listened carefully to teacher candidates and situated the academic learning within their lived experiences and frames of reference, they found the learning meaningful and learned easily.

**The outdoor classroom helps weave the communities of land and culture.** We had read that culturally mediated instruction incorporates diverse ways of knowing and representing information. Therefore, early in the planning stages for the summer Schoolyard ecology unit, we made plans to allow the teaching and learning to occur outside. We thought that an environment without the fixed structure of a classroom would encourage more spontaneous discovery, unconstrained sharing and the consequent surfacing of multicultural viewpoints. Being outside, also allowed learning to focus on knowledge and information that is more immediately relevant to the students.

Another way that we grew as culturally responsive teachers was by allowing the learning to occur within the context of culture. As stated earlier, working through the summer, we came to understand that many of the teacher candidates and the student families are integral members of the local agricultural communities. Since the schoolyard is adjacent to active agricultural fields, we encouraged the teacher candidates to purposely prepare their schoolyard lessons to recognize the interwoven communities of land and culture. As we began our exploration and observations of the expansive schoolyard, we realized that everyone was drawn to the margins of the schoolyard that contained the greatest diversity of plants and animals ranging from sunny fields to shady forest edges. Because of the accessibility of this natural diversity, these liminal spaces naturally attracted intense study of plant and animal relationships. We noticed that by concentrating their ecological studies on the plant and animal communities at the margins or borders of the schoolyard, teacher candidates were effectively deepening their connections.
between the green schoolyard, adjacent agricultural land and adjacent human communities. We realized that culturally responsive teaching intimately links local land and human communities.

**Supporting cultural and community wealth with student-created field guides.** In addition to the selection of the curriculum and field site, the learning activities were also purposely aligned to acknowledge and support the cultural and community wealth of the candidates and their students. For example, while making observations of the schoolyard, students were encouraged to make field notes using Spanish and English descriptions. Then, when they constructed their field guides with labeled drawings, they could easily develop a bilingual guide to readily share with their family members. Also, elementary students were able to make connections between their own community rendered field guides and the primary sources used to find, identify, describe, and illustrate various plants found in the schoolyard. Finally, the production of artistically rendered Schoolyard field guides provided the opportunity for students to collaboratively represent ecological concepts related to sustainability. The communal nature of inquiry-based learning provided many opportunities for peer-to-peer learning. By encouraging collaborative work on the field guides, we found that students could playfully develop their bilingual assets while practicing important life skill of collaboration.

A learning activity that supported the cultural and community wealth of the candidates and their students was the use of published natural history field guides. The colorful pictorial field guides allowed students to practice reading dense technical material in an environment that welcomed questions and discussion with their peers and teachers. Younger students read storybooks (or had storybooks read to them) about children and animals engaging with scientific phenomenon. Students and teacher candidates often used a combination of English and Spanish to ensure new concepts and academic language were communicated clearly. Turn and talks and small group discussions were particularly useful for the development of oral communication skills and academic language development. Strategically, the Schoolyard Ecology unit allowed the youth, most of whom were bilingual, the opportunity to develop their strong communication skills.

**Reciprocal learning connects home and community experiences.** We continuously learned from the teacher candidates. For example, we noticed that when the teacher candidates were faced with teaching challenging content, they employed many diverse strategies to reach all students. Early in the summer ecology, one instructor noted, “We observed teacher candidates routinely turning to song, dance, chants, visual aids and white boarding to make their learning activities more culturally responsive” (Burgess, Field notes, July 30, 2014). We also observed teacher candidates employ a variety of everyday objects as teaching aids, “Teacher candidates were also connecting with their students through their inclusion of realia or objects from everyday life used as teaching aids. Natural objects like flowers, leaves, fir cones, seeds and dirt were incorporated into the lessons and added as artifacts in schoolyard field guides” (Boyd, Field notes, July 27, 2014). We realized that part of our growth as culturally responsive teachers meant that we were open to learning collaboratively.

Drawing from their rich home and community experiences, the teacher candidates also brought unique knowledge, experiences and cultural awareness to their teaching that yielded various forms of capital. Yosso (2005) conceptualizes community cultural wealth as a distinct challenge to a deficit view of Communities of Color. He describes these assets as aspirational,
navigational, social, linguistic, familial and resistance capital. By emphasizing assets over deficits, these conceptions of capital, together, comprise a community cultural wealth that challenges traditional views of the more simplistic cultural capital.

**Community cultural wealth serves social justice.** An illustration of community cultural wealth, in service of social justice, occurred early in the summer as we prepared for the Schoolyard Ecology. We had intentionally opened community space for reflective discussion centered on the role of candidate’s knowledge and theories in support of education for social justice. When it became clear that the MYA was in jeopardy because of low student enrollment, the instructors and teacher candidates brainstormed a solution and solved our summer enrollment crises. Teacher candidates used their deep community ties, sense of history, memory and cultural intuition to call local Latina/o parents and recruit individual children into the program (Familial capital). They described the rich educational program to parents and community members utilizing multiple communication strategies and languages (Linguistic capital). They creatively worked across family networks and community resources to arrange bus transportation for the children (Social capital).

Finally, by creating pathways that invited the families to share their “funds of knowledge”, teacher candidates were able to develop a better sense of their student’s background knowledge and abilities (L. Moll, Amanti, Neff, & Gonzalez, 2005; L. C. Moll et al., 1992). The application of the teacher candidate’s community cultural wealth created a wave of support from the local families for participation in the MYA. As instructors interested in culturally responsive teaching, the original recruitment crises enlarged our appreciation of the importance of family connections. We realized that an assets approach is integral to creating successful communities.

**Question 2: How can learner-centered teaching, modeled in a content immersion and applied while teaching field ecology begin to change teacher candidate’s beliefs about teaching and learning?**

**Pedagogical assumptions are challenged.** The initial Content Immersion in cell biology deeply challenged candidates’ pedagogical assumptions around the roles of the teacher and student. With minimal telling, the curriculum unfolds as a series of woven questions and evidence collection activities that occur mostly indoors. Though students have the opportunity to compare their ideas developed in class with the ones found in national standards, the lack of teacher-centered lecture provoked most candidates to eventually plead with the instructors “please, just tell me if I am right” (Dowdy, Field notes, July 2, 2014). As learner-centered instructors, our response was carefully crafted to ask questions and lead evidenced based discussions. Occasionally, we might offer “scientist’s ideas” as short readings that help students become aware of how their own ideas compare with those accepted by scientists. Eventually, candidates understand that their learning relies on the robust collection of evidence and their own reasoning. Incremental validation by their instructor becomes an outmoded learning strategy as candidates learn to trust their use of evidence to make sense of complex phenomenon.

**Growth in content understanding of cell biology exceeds expectations.** The gains made by the teacher candidates in their content understanding of cell biology exceeded expectations (32.3 percentage points in average improvement). Also, the successful content immersion served to
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In surveys candidates reported feeling more confident in their ability to learn and understand science. As one candidate stated: “it was very exciting to learn and understand science because it has always been my biggest struggle” (Dowdy, Field notes, July 3, 2014). Another candidate expressed her most significant learning experience as “I was responsible for my own learning and was backing my answers by using evidence” (Dowdy, Field notes, July 3, 2014). After intently studying cell processes, another candidate exclaimed, “I love my body, it is amazing in its complexity” (Burgess, Field notes, July 3, 2014). Previous studies have also noted candidates confidence about teaching biology and earth science increases as their own content knowledge increases, the same is not true for physics and chemistry (Yilmaz-Tuzun, 2008). Future alternative route certification programs should consider focused content immersions as an important design consideration.

**Personal interest in science grows.** Teacher candidates also experienced significant gains in their personal interest in science and the connection between what they can learn about science and the real world. This is an important gain for future teachers and is captured succinctly in the candidate quote about science inquiry, “This kind of science is very colorful and has lots of dimensions. Science is just life, we’re just going deeper” (Dowdy, Field notes, July 27, 2014). If teacher candidates actually enjoy learning about science and engaging in science inquiry they are more likely to design the same kind of experiences for their future students (Bradford & Dana, 1996; Schoon & Boone, 1998; Watters & Ginns, 2000). While the teacher candidates did not make significant gains in their confidence as learners of science, they did feel more prepared to be effective teachers of science through this program. For example, one teacher candidate said “The coolest thing I learned was that there are several ways to teach science, not just a textbook but through scaffolding” (Dowdy, Field notes, July 27, 2014). While significant gains in both would have been desirable it is more important that the candidates feel prepared to engage in science learning with their students.

**Learning theory-aligned science instruction decreases.** The teacher candidates showed a significant decrease in their learning theory-aligned science instruction. This decrease is potentially due to the “ceiling effect” noted by Horizon Research Incorporated (Smith, Smith, & Banilower, 2014). The teacher candidate’s very high pre-survey score of 5.60 out of 6.0 on this measure suggests that they may have reached their ceiling. However, the possibility cannot be ignored that their conceptions were altered by either their experiences with students or interactions with in-service teachers immediately preceding the post-survey. This is similar to what Ohana (2004) found when she examined the conceptions of teacher candidates during their field experience. She found that candidates with more extensive experiences in schools and those organized in a cohort were more likely to look at their own experiences and to their peers rather than what was learned in their methods courses.

**Learner-centered instruction transfers from indoor to outdoor settings.** Our concern that the learner-centered instruction would transfer from indoor to outdoor settings was alleviated when our candidates left the Schoolyard to scout their midweek field trip to a local National Estuarine Research Reserve. Candidates had spent several days familiarizing themselves with their Schoolyard habitats and had made many discoveries based on iterative observations. The goal of the field trip was to provide students a chance to compare their Schoolyard habitat observations to a novel place. Now, as they planned the field trip, candidates effectively demonstrated learner-
centered teaching strategies in their lesson planning and logistics. Teacher candidates collaboratively established teaching stations along the 1-mile upland trail and planned to use these stations as *outdoor learning rooms* – sites where students could collect habitat information and make connections back to the Schoolyard habitats.

Candidates then created learner-centered activities that included using student’s prior knowledge (obtained from the schoolyard investigations and recorded on student science journals) to develop hypotheses about the new habitats. They scripted questions that encouraged students to test their initial ideas by making new observations. They planned student discussions using mini-white boards that provided evidence and visual thinking to support students’ new collaboratively derived ideas. Since this deep learning would take time and focus, candidates solved the logistical challenge of sharing intimate access to the trail habitats.

**DISCUSSION**

We began the summer wondering how we might become more culturally responsive and socially responsive in our teaching. Working with the fifteen teacher candidates through the summer extended our own conceptions of culturally responsive teaching in many dimensions. Throughout the summer it was amazing to witness the teacher candidates’ confidence grow as learners and teachers of integrated science. Initially many struggled with the inquiry-type lessons used in the content immersion, yet, they not only gained confidence about their ability as learners of science but were also overwhelming enthusiastic about teaching science. One candidate reflected, “It is very exciting to learn and understand science because it has always been my biggest struggle” (Dowdy, Field notes, July 3, 2014). Over time, teacher candidates were easily able to employ a variety of learner-centered strategies with their own students such as white boarding, song, dance, chants, art integration, realia, and a variety of purposeful grouping strategies to enhance student learning. To support student thinking and talking while acquiring academic language, candidates purposefully selected diverse texts for their students such as field guides and storybooks. Candidates also routinely used simple academic language supports including sentence stems and summary frames that encourage verbally summarizing a passage to a partner.

**The Role of Collaborative Reflection**

The candidate’s growth as student-centered educators paralleled our own growth as culturally responsive instructors. This growth was nurtured through timely and collaborative reflection that was purposely woven into the fabric of the program. Throughout the field experience instructors and candidates had ample opportunity to reflect on their practices during end of day meetings with the entire group. We also had time to reflect in grade band groups with the individual cooperating teachers as we collaboratively refined plans for the next day. For instructors, the open reflections were a reminder that teacher candidates bring a rich foundation of experience working directly with young learners in school settings. After a particularly poignant discussion about the inequities inherent in some school communities, one instructor wrote, “Each time we invite candidates to share their rich cultural and cognitive experiences in the classroom and field study, we observe the learning community blossoms” (Burgess, Field notes, July 27, 2014). For candidates, the reflections were of immediate value as grade band groups selected instructional strategies linking learner-centered activities to assessments for the next day.
By modeling consistent reflection, we hoped to establish a career-long commitment to reflective practice (Abell & Bryan, 1997; Ohana, 2004; Tosun, 2000; Zembal-Saul, Blumenfeld, & Krajcik, 2000). During our reflections, it became clear that when the content was connected closely to both the candidate’s and student’s lives and experiences, they quickly grasped concepts and made deeper connections. For example, toward the end of the summer program, one candidate wrote us a note, “Thank you for reminding me that this world is so beautiful and there is so much we can learn from it every single day especially if we hope to preserve any of it” (Burgess, Field notes, July 27, 2014). This teacher candidate obviously appreciated our summer focus on empirical practice but also linked an appraisal of beauty to preservation of the natural world.

**Metacognitive Shifts**
There were also many shifts in our group’s metacognitive awareness. We found that as we facilitated discussions that focused on the learning processes of elementary students, teacher candidates similarly began to examine the organization of our own thinking and learning. For instance, one teacher candidate noted, “just as we did in the cell unit, when I encourage students to read out loud and verbalize their thinking in small groups they quickly acquire academic language” (Burgess, Field notes, July 2, 2014). During the content and field immersions, candidates increasingly felt comfortable articulating the circumstances that best supported their own metacognitive processes. For example, one teacher candidate wrote, “I was responsible for my own learning and backing my answer by using evidence” (Dowdy, Field notes, July 2, 2014). Another candidate became quite clear that she, “learned best when working collaboratively and systematically” (Dowdy, Field notes, July 2, 2014).

As instructors, we learned to listen to candidate’s voiced needs and to increasingly provide learning situations that supported collaborative group work with clear learning targets and criteria for success. Foregrounding the importance of formative assessment to learning, one instructor reflected on the routine practice of sharing learning targets and success criteria, “When we allowed time for candidates to articulate, in their own words, why the learning targets are important; allowed time for them to discuss what success looks like; then, when we returned to the learning targets throughout the lesson, candidate’s learning was clear and cohesive. When we neglected these steps the students seemed to fly blind. Not knowing your learning destination really hinders getting there” (Burgess, Field notes, July 2, 2014).

In a reciprocal fashion, we found that when candidates began planning the schoolyard ecology lessons, they increasingly adopted more learner-centered constructivist approaches to planning and assessment that mirrored their own learning preferences established during the content immersion. By modeling a learner-centered pedagogy that could be applied later by the teacher candidates when teaching the Schoolyard Ecology unit, the content immersion effectively bridged micro (cells) and macro (ecology) systems. Future alternative route certification programs should consider focused content immersions as an integral design consideration.

**CONCLUSION**
Living close to the land is no guarantee that a child will have opportunity to explore and learn about the natural environment right outside their school. Though migrant children that live in close proximity to the land may intimately know the ebb and flow of the changing seasons, they
often do not have a context to share their funds of knowledge at school. Teachers can ameliorate this condition by taking their students outside for focused inquiries. By listening to student questions and valuing their knowledge of the local ecology the door to co-learning begins to open. Programs that train teachers can nurture culturally responsive teaching as a foundational perspective.

By opening our classroom to the Schoolyard, we observed instructors, teacher candidates and their students build a dynamic interconnected community of learners. As teacher candidates navigated small group investigations of plants and insects, we came to realize that learning in natural settings is a compelling and effective way to bridge diverse human communities while initiating new teachers to science instruction that is culturally responsive. Thus, by respecting our student’s cultural integrity we were able to engage our learners in a pedagogy that crossed disciplines and cultures. Finally, by utilizing learner-centered teaching to link a content immersion in cell biology with a schoolyard ecology unit we effectively worked at the intersection of science and culture in service of a more just and equitable world.

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References


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Don Burgess

Carly Boyd

Scheree Dowdy

Exploring the margin of the playfield

“The coolest thing I learned was that there are several ways to teach science (NOT just a textbook) through scaffolding.”