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Sharon Dole

Western Carolina University, dole@email.wcu.edu

Lisa Bloom

Western Carolina University, bloom@email.wcu.edu

Kristy Kowalske

Western Carolina University, kristykdoss@gmail.com

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ARTICLE

Transforming Pedagogy: Changing Perspectives from Teacher-Centered to Learner-Centered

Sharon Dole, Lisa Bloom, and Kristy Kowalske (Western Carolina University)

This study used an online-structured interview methodology to examine the impact of an intensive field experience in facilitating problem (PBL) and project-based learning (PjBL) on teachers' pedagogy. The purpose of the study was to determine to what extent the field experience had transformed their teaching. Data were collected in the form of online interviews with 36 participants who completed the gifted education licensure program at a regional state university in the southeast. The online interviews were followed up with telephone interviews with four of the participants. The resulting themes can be grouped under the major categories of teacher-related and student-related themes. This article will focus on the teacher-related themes, the most important being the change in the teachers' pedagogy. The article will further discuss the obstacles that stood in the way of the teachers' successful implementation of PBL and PjBL.

Keywords: problem-based learning, project-based learning, learner-centered pedagogy

Introduction

High-stakes testing and scripted curriculum in K–12 classrooms have resulted in the disempowerment of teachers as well as students. Teaching to the tests has led to the adoption of teacher-centered pedagogical strategies to meet the time and content demands of the tests (Grant & Hill, 2006). In fact, some researchers have gone so far as to say that high-stakes testing has restricted pedagogy (Barksdale-Ladd & Thomas, 2000; Nieto, 2003). Fullan and Langworthy (2013) argue that, unless a new pedagogy materializes, students will become increasingly bored and unmotivated and teachers will become even more stressed. They contend that new pedagogies will require changes in the relationships between teachers and students, in teaching and learning strategies, and in how learning is assessed, as the skills needed in the 21st century may not be amenable to paper-and-pencil tests. While progressive charter schools like High Tech High (see www.hightechhigh.org) have been using learner-centered models of pedagogy such as problem (PBL) and project-based learning (PjBL), public schools have been slower in adopting learner-centered pedagogies (Wagner, 2012; Zhao, 2012).

Although PBL and PjBL are similar, each has unique characteristics (Benoit, 2000; BIE, n.d.; Esch, 1998; Hung, 2011) that distinguish one from the other. Whereas PBL begins with a problem for students to solve or learn about, PjBL be-

gins with an end product or “artifact” in mind. The problems in PBL are ill structured to mirror the complexity of real life; the problems in PjBL use a production model and, as such, mirror the real-world production model. In PjBL, the end product is the driving force, while the defined problem is the driving force in PBL. In PBL, students present the conclusion of their problem-solving process but do not necessarily create a product as a result. The skills and content knowledge acquired during the production process are important to the success of completion of the final product in PjBL.

Both PBL and PjBL are considered inquiry-based learning methods, which are pedagogical methods that have roots in constructivist philosophy, particularly the work of Piaget, Dewey, and Vygotsky (Dewey, 1997; Ginsburg & Opper, 1987; Vygotsky, 1962). Inquiry learning involves creating questions, doing research to address the questions, analyzing and interpreting the data, and coming up with possible solutions (Bell, Urhahne, Schanze, & Ploetzner, 2010; Wilhelm & Wilhelm, 2010). In PBL and PjBL, teachers assume the role of facilitator or coach rather than the transmitter of knowledge. With teacher guidance, students choose authentic problems or challenges, conduct research, and work collaboratively on solutions for real audiences over an extended period of time (Barron & Darling-Hammond, 2008; BIE, n.d.; Savery, 2006; Thomas, 2000). The curriculum is not segregated into individual subjects, which allows students

to develop cross-curriculum skills, learning and applying their knowledge where they need it (Papert, 2001). A key element in PBL and PjBL is student choice; students exhibit increased motivation by planning their learning and organizing their own research in solving real-world problems (Bell, 2010). In the process, students develop skills needed for the 21st century, such as the ability to frame, investigate, and solve problems; the ability to acquire and evaluate information; the ability to collaborate effectively with others; the ability to work with a variety of technologies; and the ability to develop new ideas and products (Bell, 2010; BIE, n.d.; Darling-Hammond, 2010; The Secretary's Commission on Achieving Necessary Skills, 1991; Wagner, 2012; Zhao, 2012). Additionally, PBL and PjBL contain the elements necessary for deeper learning, including content mastery, critical thinking and problem solving, effective communication, self-directed learning, and academic mindsets (Hewlett Foundation, n.d.). Students acquire and retain knowledge when they are engaged in their learning and when they can apply what they are learning to the real world. When students have growth mindsets as opposed to fixed mindsets, they believe in themselves and their own abilities and they will persist in the face of obstacles (Dweck, Walton, & Cohen, 2014; Farrington, 2013).

PBL and PjBL pose challenges for both teachers and students as their roles and responsibilities differ from those in a classroom in which direct teaching strategies predominate (Bradley-Levine & Mosier, 2014; Ertmer & Simons, 2006; Pecore, 2012). In their examination of the literature and in their own research, Grant and Hill (2006) identified five factors that play an important part in teachers' decision to use student-centered pedagogy. Those factors are: (1) recognition and acceptance of new roles and responsibilities on the part of teachers and learners, (2) comfort level of teachers and learners, (3) tolerance for ambiguity and flexibility, (4) confidence in integrating technology, and (5) integration of the new pedagogy within the larger realities beyond the classroom (p. 23). The last factor is of primary importance, especially as it relates to high-stakes testing. Teachers are influenced by the larger educational culture of their schools, which can have a negative impact on the implementation of a learner-centered pedagogy. In the state where the research took place, teachers and schools are rated according to their students' standardized test scores, and this information is made public. It takes more time to do extended projects and solve real-life problems, and teachers must make decisions of depth versus breadth regarding the curriculum. High-stakes tests with multiple-choice right/wrong answers do not adequately reflect the more thorough, in-depth study of topics that are associated with student-centered strategies and, importantly, do not measure 21st century skills.

Literature Review

There is a growing body of research that shows that inquiry-based learning models such as PBL and PjBL lead to deeper, more sustained learning that transfers to new situations and problems (Barron & Darling-Hammond, 2008; Thomas, 2000). However, PBL, PjBL and other inquiry-based models can be challenging to implement in a culture of standards-based curriculum and assessment. Changes in curriculum and assessment as well as in teaching methods are needed for successful implementation (Barron & Darling-Hammond, 2008). These changes often require a steep learning curve for teachers as well as for students. Teachers need to fully understand the complexities involved in their new roles as facilitators of knowledge building rather than transmitters of knowledge.

There has been some research on how to best support teachers in the implementation of new methods of teaching and learning (Darling-Hammond & McLaughlin, 2011; Fishman, Best, Marx, & Tal, 2001; Opfer & Pedder, 2011), but much more research is needed. Teacher professional development is often relied upon as a strategy to improve teaching practice, but frequently has disappointing results (Opfer & Pedder, 2011).

Korthagen and Kessels (1999) posit that there is a transfer problem in teacher education and teacher professional development. It is difficult for teachers to transfer what they learn in their preparation programs and professional development to the classroom because of teachers' preconceptions about teaching and learning, a disconnect of theory to the realities of the classroom, and the nature of relevant knowledge. With regard to the nature of relevant knowledge, Korthagen and Kessels argue that content in teacher education and professional development is often more theoretical and abstract than the practical knowledge they need in the classroom, creating the often touted gap between theory and practice. Korthagen and Kessels argue that a realistic approach to teacher preparation that immerses teachers in practice and allows for their own personal creation of knowledge, meaning, and theory through experience will make a difference in teacher practice.

Research thus far indicates that teacher education and professional development needs to be of sufficient quality and quantity in order to affect change in teaching practices (Fishman et al., 2001). Teachers need time to think about, discuss, and practice methods in order to adopt those that are new to them (Garet, Porter, Desimone, Birman, & Yoon, 2001). According to Darling-Hammond and McLaughlin (2011), teacher education that results in changes in pedagogy requires teachers to be active in the learning process, to learn through the same methods they will be using with their

students, and to engage in collaborative inquiry and reflection. In other words, to “understand deeply, teachers must learn about, see, and experience successful learning-centered and learner-centered teaching practices” (Darling-Hammond & McLaughlin, 2011, p. 83).

Description of the Course

In the 12-credit hour gifted education licensure program at a regional state university in the southeast, the focus is on promoting creativity and innovation. One course in the program, “Creative Thinking and Problem Solving,” focuses exclusively on PBL and PjBL. The PBL model that teachers receive instruction on is Barrow’s Hybrid PBL model, which requires learners to use a high degree of self-directed learning to solve ill-structured problems (Barrows, 1986; Hung, 2011). The PjBL model that students are instructed on is the Buck Institute for Education (BIE) model, whose website contains a wealth of information on PjBL (<http://www.bie.org/>). The ultimate goal of the course is for teachers to apply PBL and/or PjBL in their own classrooms. PBL and PjBL are the focus of three modules in the online portion of the course preceding the field experience. In one module, the teachers are introduced to PBL and PjBL by reading the literature, looking at videos of classroom examples, and examining a Venn diagram showing the differences between the two methods. A second module focuses on implementation, and a third module focuses on assessment of PBL and PjBL. Assignments in each module are guided by the principle questions of that module. For example, the principle questions for the module on evaluation are the following:

- What evidence should we look for when determining in-depth understanding rather than superficial understanding?
- How do we know if our students have achieved the desired results of PBL and PjBL as well as met the state or national standards?
- What kinds of assessment tasks will guide the facilitation of PBL and PjBL?
- How do we promote self-assessment in our students?

The teachers in the course facilitate PBL and PjBL the week following the online portion of the course in a field experience on campus called Rocket to Creativity (RTC). Guided by teachers experienced in using PBL and PjBL, RTC provides participants the opportunity to experience PBL and PjBL first hand, experiment with implementation, and discuss and reflect successes and challenges with colleagues in a

nonthreatening environment. Over the 13 years that we have had the field experience, we have observed a transformation in many of the teachers during the week, and we became interested in finding out to what extent the experience had changed their pedagogy. Thus, the purpose of this study was to ascertain to what extent the intensive one-week field experience facilitating PBL or PjBL had transformed the teachers’ pedagogy from teacher-centered to learner-centered. A secondary purpose was to examine the obstacles that stood in the way of the implementation of PBL/ PjBL in K–12 classrooms. Our study adds to the knowledge base on how professional development can best prepare K–12 students for the 21st century.

Description of the Field Experience

The purpose of the one-week summer field experience is to implement the elements of PBL or PjBL that the teachers have learned in the preceding four weeks in the online portion of the course. The gifted license is an add-on license, that is, the teachers need to already have a teaching license in elementary, middle grades, a high school content area, or special education. Therefore, the teachers taking the course are in-service teachers. For the field experience, the teachers are placed in teams of two by the instructors who co-teach the course. During the week of field experience, each team of teachers facilitates PBL/ PjBL with a group of children ages 6–14 who have registered for Rocket to Creativity. The proceeds from registration are used to purchase materials, to pay for the lunches of the teachers, and to employ teachers experienced with PBL and PjBL to work as assistants.

The children are assigned to groups of five or six based on their ages and interests. There have been a variety of groups over the 13 years of the program, including Crime Scene Investigation, Robotics, Amateur Aeronautics Academy, Novel Innovations, Clown around with Animation, Spy and Espionage, Digital Storytelling, The We-Dig Archaeology Club, and Costume Creators Guild. The teachers spend an hour planning each morning before they meet with the children from 10:00 a.m. to 4:00 p.m. Much of the first day is spent brainstorming projects and/or problems, locating resources on campus, and planning a timeline for the week. The children within each group collaborate, choosing to work on either a problem or a project that they come up with related to the topic of their group. Having the field experience on campus gives the groups access to a wealth of resources, including computer labs, the library, a museum featuring mountain heritage, an art museum, the forensic lab, and the archaeology lab. Additionally, faculty members, campus police, and instructional technology staff are available and can serve as consultants. During the last hour of each day, all the teachers

get together to share and reflect on the day's activities, challenges, and successes. During the week the teachers help the children develop rubrics that they use at the end of the week for self-evaluation. The week ends on Friday with the parents coming to examine the creative projects and problem-solving process accomplished during the week.

Method

We conducted this study for the purpose of understanding the impact Rocket to Creativity had on teachers and in their classrooms. Our research questions were the following:

- How does immersion in a week-long PBL/PjBL teaching/learning environment impact pedagogy?
- What obstacles do teachers face when implementing PBL and PjBL?

We used an online-structured interview method (Singleton & Straits, 2012) for the design of the study. When analyzing a program or practice, interviews are a valid tool. The internet has allowed researchers to use conventional methods of research in a new medium; researchers have adapted face-to-face approaches to interviewing for the internet (James & Bucher, 2012). As the participants in our study had successfully completed the online licensure program, they were comfortable with the online environment. This approach met our expectations as we were searching to uncover the impact the field experience made on the pedagogy of the instructors. Allowing the participants to describe their experiences through asynchronous, online-structured interviews gave them the ability to be open and honest, an important component for interview methodology (Wetherell, Taylor, & Yates, 2001).

Data Collection

Structured Interviews Delivered at a Distance

We conducted online-structured interviews with students who completed our university's Academically or Intellectually Gifted (AIG) licensure program consisting of four courses and a field experience. We crafted 29 open-ended and demographic questions to include in the structured interviews in order to understand how the field experience impacted their pedagogy (see Table 1).

Telephone Interviews

In order to elicit further information about findings from the survey, we asked volunteers to participate in phone interviews. A graduate assistant working with us on the research

project conducted the follow-up phone interviews, which consisted of nine questions (see Table 2). Detailed notes were taken during the interview process.

Course Feedback

Students posted anonymous feedback embedded on the discussion board in the Learning Management System at the end of the course, describing strengths and weaknesses and offering feedback about course assignments and the field experience. We were only able to access the past three years of the feedback, as earlier courses were unavailable. These posts were anonymous and confidential, viewed only by the instructors of the course.

Participants

We sent the structured online interview by email twice to 164 teachers who had completed the gifted licensure program, and 50 participants began the online survey. Five of the 50 participants responded that they did not use PBL or PjBL, so the interview ended there for them. Although responding that they did use PBL and/or PjBL, nine participants abandoned the survey without providing comments about their experiences implementing these techniques. Therefore, we decided to base the results on the 36 participants who completed the entire online interview. In addition, we asked participants if they would be willing to participate in a follow-up interview. Four participants indicated a willingness to participate. All participants in the study are referred to by pseudonyms.

Data Analysis

We began the data analysis process by individually reading the online-structured interviews multiple times. Using open-coding, each researcher recorded her initial thoughts (Merriam, 2009). We then began to create relevant themes (Patton, 2002) and then compared the themes among the three of us, thus establishing inter-rater reliability (Wetherall et al., 2001). The themes emerged inductively from common descriptions offered by the participants (Seidman, 2006) such as changes in the classroom, changes in students, and challenges teachers faced while using these methods. Together, we determined areas of interest to pursue in the follow-up interviews and crafted questions to utilize. Specifically, we were interested in gathering further information about how teachers assessed students working on PBL or PjBL projects, how teachers integrated PBL and PjBL with other models in gifted education, how these methods prompted deeper learning in the classroom, and how teachers overcame potential obstacles for implementing these methods, such as pressure for students to perform well on standardized tests. Data from the four follow-up interviews provided details and elaboration for

Table 1. Online Structured Interview Questions

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1. Do you use project-based learning in your classroom?
 2. Please describe how you have incorporated project-based learning in your classroom.
 3. Did you use project-based learning before taking the course *Creative Thinking and Problem Solving*?
 4. How did the field experience using project-based learning influence your teaching?
 5. How has project-based learning benefitted your students?
 6. Describe how project-based learning has influenced your teaching pedagogy.
 7. What obstacles have you encountered in implementing project-based learning?
 8. How have you overcome those obstacles?
 9. Would you recommend project-based learning to others?
 10. Why or Why not?
 11. Have you provided any professional development on project-based learning to other teachers?
 12. Additional comments on the use of project-based learning:
 13. Do you use problem-based learning in your classroom?
 14. Please describe how you have incorporated project-based learning in your classroom.
 15. Did you use problem-based learning before taking the course *Creative Thinking and Problem Solving*?
 16. How did the field experience using problem-based learning influence your teaching?
 17. How has problem-based learning benefitted your students?
 18. Describe how problem-based learning has influenced your teaching pedagogy.
 19. What obstacles have you encountered in implementing problem-based learning?
 20. How have you overcome those obstacles?
 21. Would you recommend problem-based learning to others?
 22. Why or Why not?
 23. Have you provided any professional development on problem-based learning to other teachers?
 24. Additional comments on the use of problem-based learning:
 25. How has the implementation of the Common Core and accountability procedures affected your teaching practices?
 26. What experiences were the most meaningful at Rocket to Creativity?
 27. What grades do you currently teach?
 28. Type of school where you teach.
 29. How many students does your school serve?
-

Table 2. Telephone Interview Questions

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1. Can you describe how you have used problem-based learning?
 2. Can you describe how you have used project-based learning?
 3. How do you assess problem and/or project-based learning?
 4. Have you combined problem-based learning or project-based learning with other models of gifted education? If so, which ones?
 5. Can you offer examples of PBL or PjBL and how your students have responded to and/or benefited from either?
 6. Can you give examples of how your field experience (SPED 400/500) influenced your teaching?
 7. Can you give examples of how PBL and/or PjBL leads to deeper learning in your students?
 8. Some teachers said in the online interview survey that they don't have time to use PBL or PjBL because of the testing requirements. Do you agree with this? Why or why not? Is it possible to do PBL or PjBL and still have your students achieve high scores on End of Grade (EOG) tests?
 9. Is there anything else you would like to add?
-

several of the initial themes. Comments from the structured online interviews and the follow-up interviews were coded and organized into tables. After creating the tables, we returned to the online interviews and follow-up interviews and recorded how often each supporting detail was mentioned. In order to further increase the credibility of the themes found in the online and follow-up interviews, we analyzed course feedback (Farmer, Robinson, & Elliott, 2006). The course feedback provided information about the field experience, while the structured online interviews and follow-up phone interviews offered details about implementation of PBL and PjBL in the classroom. Furthermore, because all three of us had either co-taught the course and/or coordinated the field experience, and as a result were familiar with the participants, we had insider status (Wetherall et al., 2001).

Results

The data analysis resulted in several themes that we grouped under two categories: the impact on teacher pedagogy and the obstacles teachers faced in implementing PBL and PjBL. After attending the field experience, 45% or 90% of the 50 participants replied that they currently use PBL or PjBL as an instructional method. Sixty-one percent of the 36 participants who are using PBL or PjBL and completed the interview reported that they had not used either one as a strategy prior to the field experience. Of those 36 participants, 64% described the field experience as a main factor for implementing these methods into the classroom, and 100% of the participants agreed that they would recommend PBL and PjBL to other colleagues. Participants described a variety of ways across all grade levels in which they implement PBL and/or PjBL, including animal research, planning a classroom party, raising money for Relay for Life, learning a foreign language, studying the stock market, and exploring diabetes. Becky, an elementary school teacher, described how her students formed a group to address health concerns in the community due to poor socioeconomics and a lack of parental awareness and education. They named their group Teaching Everyone About Community Health (TEACH). This organization requires students to first learn, then serve and teach the community about health concerns, providing or contributing to events on a monthly basis.

In this paper, we are focusing on the two categories where themes emerged in the data: impact on teacher pedagogy and overcoming obstacles when implementing PBL and PjBL. Several themes emerged regarding pedagogy: (1) a shift in classroom structure, (2) improvement in classroom climate, (3) change in instructional methods and teaching goals, and (4) growth in collaboration and leadership. Themes regarding overcoming obstacles when implementing PBL and PjBL are:

(1) conflicting visions, (2) challenging logistics, and (3) changing classrooms. The focus of this article is on the impact on teacher pedagogy; the impact on students when utilizing PBL or PjBL in the classroom will be addressed in a future article.

Impact on Teacher Pedagogy

The impact of the field experience on the teachers' pedagogy emerged in a number of areas. Teachers discussed how their classroom environments changed as they allowed students to take more ownership in the learning process. As teachers took on the role of facilitators, improvement in rapport with students became apparent. In addition, teachers noted an impact on the goals and methods they chose to implement in the classroom and on their role as a collaborator and leader within the school community (see Table 3).

Shifted Classroom Structure

Half of the participants specifically expressed how they learned to let go of control and become facilitators in the classroom as a direct result of the field experience and implementing PBL or PjBL. In addition to describing how they learned to become facilitators, participants provided examples about how they provided structure in new ways, allowed students to self-assess their progress, and provided students with the opportunity for choice in topics and assignments. A final component included in this theme was how becoming a gifted specialist allowed for the opportunity to change the instructional approach in the classroom.

Once teachers develop a new understanding of how to implement instruction, they must learn certain techniques. A common obstacle teachers face when implementing PBL or PjBL is the potential loss of control in an environment where students are working on numerous tasks at one time. Joy described her "aha" moment when she realized how much instruction was occurring in what appeared to be a disorderly environment:

I think my first realization that I could "let go" of control was during my field experience. Our group was *Fashion Through the Ages*. One morning when I walked in, our room was a mess. We had tape, plastic, and notions scattered about, needles and thread sticking in fabric waiting for a hand to sew, and students' sketches pinned and taped on the wall and boards. It was a mess, but a beautiful, purposeful one! That's when I realized that something was happening through all of this. Students were learning how to design, cut patterns, sew, use technology, and collaborate, all within that one classroom.

Along with comments about learning how to let go of control, participants also explained how the field experience provided them with techniques to structure the learning environment. Sarah shared:

Table 3. Impact on Teacher and Classroom

Impact	Participants
Shifted Classroom Structure	
Letting go of control / Becoming a Facilitator	N=18
Providing Structure	N=2
Assessments / Self-assessments	N=5
Student Choice	N=12
Becoming an AIG teacher	N=2
Improved Classroom Climate	
Trust	N=1
Active Student Participation	N=10
Honoring the Individual	N=8
Evoking Curiosity	N=8
Building Connections	N=5
Changed Instructional Methods and Teaching Goals	
Open-mindedness	N=3
Divergent Thinking	N=3
Critical Thinking	N=8
Effective Questioning	N=4
Integration of Content Areas	N=5
Process over Product	N=2
Real-world Connections	N=16
Problem-solving	N=4
Students Collaborating	N=6
Creativity	N=6
Assessing Prior Knowledge	N=1
Developing Problems / Designing Projects	N=3
Teacher as Collaborator / Leader	N=10

This was really a stretch for me. I really enjoyed the field experience, but I had a hard time going away from the typical concept of the classroom and what it should be like. The field experience allowed me to understand that structure could be provided in many ways.

Providing guidance, setting high expectations, and monitoring the progress of groups is essential for success when implementing PBL. Lauren reflected on the significance:

Students need gentle guidance and expectations prior to jumping right in, but then these can also be modified as we move along in the process. I am working to gain a more student-led classroom. Allowing the students to see the bar raised high and allowing them to take the reins.

Melanie explained how she utilized several differentiation strategies and student-guided activities in order to shape her PBL units. She shared:

I used differentiation strategies:

- tiered materials as I introduced the background information necessary to launch the messy problem
- flexible grouping, allowing students to self-select concept-learning groups but teaming them for their PBL work groups according to their readiness (as I determined it according to their previous year's ACT Plan scores on the subtest of English/grammar and usage)

- direct teaching of metacognitive skills and collaborative behaviors
- student choice for authors to study throughout the project
- student-proposed deadlines for checkpoint and student-arranged interim work sessions

One-third of the participants described learning about the importance of student ownership in the PBL or PjBL experience. Becky discussed being a facilitator and the impact of student's self-selecting topics of interest:

Teaching is not about me lecturing. My role is to facilitate the students' learning. I guide and lead them through independent and collaborative critical thinking. The students self-explore and self-discover strategies they can use in many aspects of their educational experience and real lives.

Learning how to teach students to effectively self-assess their progress proved to be important to five of the participants. Melanie shared:

Wow, I never would have been so comfortable telling students, "I'm here to help you get your final product done. Tell me what you want me to look at along the way, and tell me what kind of feedback you want or need at those points." Knowing that I would have to rely on students' self-evaluation of what they'd previously learned and of how they measure their own learning, I spent time helping students determine what previously learned knowledge and skills were applicable. When guided through reflection with that purpose in mind, individuals contributed HUGE amounts of information in discussion, essentially creating a common body of knowledge from which students could teach (or remind) each other without "my" being a boring pedant conducting reviews. In fact, I had to do very little review at all, freeing up more class time to work with small groups and individuals consultatively!

Participants described how their perspectives shifted as they encountered a new understanding of how students learn. Melanie shared how the field experience made her consider using PBL and PjBL with her high school students:

Working with the oldest group of campers [children attending Rocket to Creativity] was beneficial because they were closest in age to my high school students. Among most of the campers, I saw genuine interest in pursuing research to construct a product; most em-

braced the opportunity wholeheartedly. Seeing them respond so positively made me reconsider the skepticism I had about using this approach with standard high school students and extremely grade-conscious AP juniors.

Educators described how PBL and PjBL eventually saturated all of their areas of instruction. Katie shared:

My teaching drastically changed when I became an AIG [Academically and Intellectually Gifted] Specialist. I became married to PBL and now my AIG classroom is one of problem solving. I am able to bring in other skills and critical thinking through the whole process of PBL. Even spelling, writing, and vocabulary are taught in the context of PBL.

Changing from a teacher-centered environment to one that is student-centered can be challenging. Participants noted that the field experience allowed them to be immersed in an environment that appeared chaotic. By learning how to let go of control and by providing differentiation, student ownership, and self-assessment tools, participants have successfully implemented PBL and PjBL in their classrooms.

Impacted Classroom Climate

One of the most often mentioned results of implementing PBL and PjBL, mentioned 32 times by participants, was improved rapport with students. As participants changed their teaching pedagogy, they altered their classroom structure, and their relationships with students evolved. This occurred because of a variety of factors, including nurturing trust in the classroom, promoting active student participation, honoring the individual, building connections with students, and evoking curiosity. Jacob described the role of trust and active student participation:

It establishes a relationship of trust when my students realize I have confidence that they can work independently of my instruction and in essence teach themselves. Not only do they learn to solve problems but more importantly, they learn to ask questions and make observations to identify problems. Projects also introduce students to teamwork, responsibility, accountability, and leadership to name only a few.

As participants reflected on the impact of PBL and PjBL, eight participants described how it has helped them to honor students through listening and treating them as individuals. Joy explained:

I feel that I am a better listener, observer, and communicator. I hope to continue creating a learning environment where each student feels an important part of it. I

try to ensure that all students have active roles in whatever we are doing. I find that I use more peer tutoring, small groups, and team building throughout my lessons and units than I have in the past. I also encourage self-reflection and evaluation.

During the field experience, teachers worked with different age levels. Jane described how working with younger students helped her understand the importance of keeping creativity alive in the classroom:

The camp helped me see things in a different way. I usually work with high school and college level students. This was the first time I spent so much time with younger students. Their energy and level of inquiry was infectious. When I am at a loss for engaging students, especially the ones who are highly capable but NOT motivated, I think about the camp kids. If I can begin a class in an unexpected way, or let students tap into their creativity, or open the door to endless possibilities, it can change the outcome for an entire unit, week of study, day, or moment for some students. I may have to stray from a highly planned lesson, but the payoff is worth it. Students appreciate having time to “be creative” in ways that manifest their individual skills and talents, and it’s fun for me too!

Honoring the curiosity in the classroom can be infectious for both the students and the teacher.

Changed Instructional Methods and Teaching Goals

Participants discussed changes in their intentions and goals in the classroom in order to emphasize open-mindedness, divergent thinking, deep thinking, effective questioning, integration of all content areas, and process instead of final product. These changes can be seen through the way the participants described how their instructional methods changed after attending the camp. Karen explained how implementing PjBL changed her goals for her students:

My job is to move my students from the notion that they are looking for “one right answer” to the notion that there are many plausible theories and solutions to a problem. My job is to encourage patience and persistence. My job is to guide students in their development, to help them to ask deep questions, to help them discover the benefits to collaboration, to prepare them for the world.

Melanie described how the camp helped her understand the importance of explicitly describing how to become a stronger divergent thinker, “I learned the value of directly teaching divergent thinking in early stages of setting up PBL experience, and reinforcing its value with verbal feedback to students as they worked in small groups.”

Allen shared how he learned more about the thinking process, which, in turn, helped him to understand what was necessary to help students think deeply about topics. Others described learning how to develop effective questions to accompany tasks. Tori said, “I ask more questions as opposed to giving answers. I guide students to develop and attain their own learning as opposed to depending on direct instruction.”

Participants described how PBL and PjBL allow for integration of all subject areas. Tori shared, “It has increased student interest and encouraged independence as learners. It has enabled me to integrate many subject areas, skills, and concepts throughout the projects.” Karen explained:

It is challenging, motivating, and interesting for students. It promotes an understanding of how to tackle real-life problems and how math, language, social studies, and science are all connected. It encourages development of life skills like organization, collaboration, questioning, and research. It puts the responsibility of learning onto the student in a way that develops lifelong learners.

An area that is specifically targeted through the week-long field experience is that the final products are student-created. They are a work-in-progress. Joy described her experience understanding that process is more important than product.

I have used project-based learning before the field experience, but not with the same depth of understanding. Before the field experience, the project was more important than the process. I learned through the field experience that my role is significant as a facilitator. I didn’t need to control every aspect of the lesson. Students were encouraged to think independently and make mistakes along the way. Their presentations in the end were a reflection of critical thinking and problem solving. This experience influenced me a great deal.

Growth in Collaboration and Leadership

Participants also described how the field experience impacted their roles as collaborators. Jane explained:

I share my passion for real-world questions, projects, and assignments that involve technology with my grade level and subject matter peers. I also engage in at least one interdisciplinary PBL project each year. Last year with Dance, this year with Art and Creative Writing.

Along with sharing ideas, some of the participants described how they had taken on leadership roles by designing units of study for other instructors or by leading staff

developments. Elena said, “I have shared my summer camp materials and experiences with teachers at my children’s school this year and some are using my material as a resource in their classes.” Tori described reflecting with colleagues as the most beneficial part of the camp experience.

Overcoming Obstacles When Implementing PBL and PjBL

Participants in the study discussed specific obstacles they face when deciding to implement PBL and PjBL in their classrooms and solutions they found to the obstacles. Many of the obstacles stem from the school’s vision, while others pertain to specific logistics such as time and money. Participants also had to navigate changes in students as they created student-centered learning environments (see Table 4).

Conflicting Visions

In total, eight participants described facing problems with implementing PBL and PjBL units due to district mandates and pacing guides. Many described the pressure that standardized testing places on the teachers. Karen described her frustrations:

Classroom teachers face terrible obstacles when trying to use PBL or PjBL because they are being given pacing guides and scripted curriculum to follow and are reprimanded if they step outside the box. Skills are being taught in isolation, which most classroom teachers know is not as effective as integrated PBL and PjBL units that are high interest and relate learning to real life.

Several of the participants in the survey switched from being classroom teachers to AIG specialists. Because they serve

students in a different capacity, they have been able to overcome this obstacle. Mandy explained:

As an AIG Specialist, I see the usefulness of PBL and PjBL. In today’s regular education classrooms, it is difficult for teachers to provide PBL and PjBL because of the dictated schedules that many schools follow in order to prepare for testing. I am lucky to have a more flexible schedule which allows for more creative approaches to teaching. Although this seems to be changing somewhat even for AIG specialists, I am hopeful that my schedule will remain flexible enough to continue to use PBL and PjBL.

For seven of the participants, helping teachers or administrators understand the effectiveness of PBL and PjBL was a hurdle they had to overcome. Linda described the complications with interpreting Common Core. She shared:

I teach first grade and the Common Core for this level has not made a huge impact on my teaching as I have, for a long time, sought to find ways to teach my kids to think deeply and to extend their learning whenever they are ready. However, in my county, there has been an unfortunate emphasis on skills-based work (ironically enough, due to the administration perceptions of the new curriculum and the testing that follows), which has made it difficult to implement truly researched-based best practices like PBL and PjBL. There is, thankfully, some resistance to this from our teachers, but it has been a slow slog!

As a solution to this issue, 10 participants have shared knowledge about PBL and PjBL by offering professional development at their schools or at state conferences.

Table 4. Obstacles Faced When Implementing PBL and PjBL

Obstacle	Number of Participants
Conflicting Visions	
Dealing with District Mandates/Pacing Guides	N=8
Educating School Personnel	N=7
Comparing Data	N=2
Challenging Logistics	
Time	N=14
Finding/Cost of Materials	N=5
Designing PBL Units	N=3
Access to Technology	N=2
Changing Classrooms	
Student Independence, Work Ethic, & Motivation	N=7
Number of Objectives in Common Core	N=3
Facilitating Numerous Projects at One Time	N=1
Parent Concerns	N=1

With the nationwide focus on professional learning communities (PLCs), two participants described issues due to the inability to compare data for students. Sarah shared:

With the emphasis on data driven instruction and the utilization of flexible groups and rotating between different teachers, it is difficult to stray from our pacing guides and materials. If I am doing something completely different to meet a standard, it is hard to compare my students to others for the purpose of small groups. Also, with our new Parent Portal for grades being online, the grades and assignments I give have to be almost identical to what the other teachers give. The other teachers are not interested in doing these types of projects or problems so I can't either.

Other participants described finding a balance between time spent on PBL and PjBL and supporting the school-wide or countywide mandates. Jane described her county's mandate to provide individualized, data-informed instruction to each student. She said, "PBL is one terrific way to have a fighting chance to accommodate this mandate, especially with classes with 30+ students!"

Challenging Logistics

Tied closely to dealing with mandates and pacing guides, 14 participants also voiced concerns with time management. PBL and PjBL units vary in length and complexity. Some participants who are AIG specialists may have the freedom to implement PBL and PjBL, but they may not have a sufficient amount of time with students to implement PBL and PjBL units. Karen shared:

My main obstacle now is time. I only get to meet with my students once a week for an hour so it's sometimes tricky keeping up the momentum of the PjBL unit as well as coming to a conclusion in a reasonable amount of time.

In order to address the issue of time management, participants described the importance of understanding how to facilitate the class. Alexis said:

PjBL units can take weeks, because you have an idea when they may end, but they can become longer as students go deeper or begin product design. Flexibility and integration of core curriculum helps overcome this problem. As a teacher, know when to be flexible. Help to keep students going and stay on task without running off into tangents. This comes from really learning how to facilitate a PjBL. I don't know if facilitation is learned or it comes naturally, but I have always been able to "see" when they struggle or need more focus, and through questioning, I am able to keep things going.

Autumn described how time management becomes easier as students learn how to navigate the PBL and PjBL process. She shared, "Students get better at working collaboratively as they do more projects. In order to save time, I make sure that the projects are directly aligned to several essential standard objectives."

In addition, participants described other obstacles. Some faced issues of finding and purchasing resources. Participants overcame this obstacle by asking for donations and applying for grants. Three participants noted having issues with designing PBL or PjBL units, while two others described a lack of access to technology.

Changing Classrooms

Seven of the participants voiced concerns with student performance being an obstacle to implementation. They described various techniques to overcoming these obstacles including allowing students to struggle at times. Jessica described how she addresses students who struggle with the process involved with PBL/PjBL. She said, "Encouragement, allowing students to fail and helping them find ways in which to turn it around to be successful. Implementing these will help them to be better citizens." Other participants described utilizing specific tools to help students succeed, as seen here from an anonymous response from the end-of-course survey:

I view the PBL as a strategy to assist my students in taking ownership for their learning. I'm excited to watch my students develop into more independent learners and critical thinkers and problem-solvers. I'm equipped with specific strategies (calendars, rubrics, questioning, conferences, etc.) in my toolbox to help my students be successful with PBL. Before this class, I would have never incorporated this type of learning into my lessons; now, I'm equipped and will use PBL. I'd say—"That's progress!"

In addition to helping students understand the dynamics of a student-centered learning environment, one participant noted having to alleviate parental concerns. Including enough Common Core objectives and facilitating numerous projects at one time were other obstacles participants faced.

Discussion

In this study, we were interested in whether teachers would change their pedagogy given the opportunity to learn about and experience PBL and PjBL firsthand. Changing one's teaching practices can be a risky business. In order to prepare children for standardized tests, many teachers, including the ones in this study, may be more comfortable with more traditional pedagogies. Teachers often rely on perceived tried-

and-true classroom pedagogies that teach to the test and require students to passively obtain new information and skills in order to do well on high-stakes exams. PowerPoint lectures and teacher-directed instruction prevail in many classrooms. Teacher-directed instruction gives teachers control of the curriculum and the pace at which it is presented. It takes a leap of faith to try a different approach.

Similar to the findings of Grant and Hill (2006), teachers in our study reflected on their own comfort levels and those of their learners, as well as tolerance for ambiguity and flexibility. For example, the teachers in our study expressed their trepidation regarding giving up control in the classroom. In fact, each year, in the weeks prior to RTC, teachers express their anxiety about coming to spend a week with children without structured lesson plans in place. Immersion in PBL and PjBL during the week of RTC allowed teachers to experience turning control over to their students, a risk they may not have been willing to take in their own classrooms. It takes the first day or two each year of RTC for some of the teachers to give over the control to their students. For many, it is a gradual process, but by the end of the week, teachers are amazed with the students' ability to direct their own learning and their own ability to let go. The RTC experience provided teachers with the assurance they needed regarding the viability of PBL and PjBL for enhancing student learning. The training and opportunity to experience PBL and/or PjBL in a nonthreatening, supportive environment resulted in increased implementation, perceived benefits of PBL and PjBL, and transformation of teaching practices from teacher-centered to student-centered learning from the majority of the participants.

With changes in pedagogy come changes in teacher-student dynamics. The teachers in our study reported positive shifts in the climate of their classrooms and improved relationships with and among their students as a result of using PBL and/or PjBL. This finding concurs with research on inquiry-based pedagogies that promote student-centered learning, cooperation, and interdependence. For example, in their study on the effects of PBL in environmental science, Haney, Jing, Keil, and Zoffel (2007) found that teachers reported positive changes in classroom climate and student-teacher relationships over two years of implementation of PBL. Johnson and Johnson (2009) document remarkable evidence from years of research that educational practices such as PBL and PjBL, which promote peer interdependence, have a positive effect on students' effort to achieve, the quality of their interpersonal relationships, and psychological health.

With their newfound confidence and assurances for using PBL and/or PjBL, teachers still find obstacles with implementation in their own schools' classrooms. As suggested by Grant and Hill (2006), incorporating student-centered practices requires the ability to integrate new pedagogy within

the context and demands of the school. For example, our teachers talked about the lack of a shared vision for PBL and PjBL and time and resource constraints, obstacles often mentioned in PBL and PjBL literature (Park & Ertmer, 2008; Vega, 2012). While some of our teachers working in programs with gifted students had more flexibility, others surmounted those obstacles creatively by implementing PBL and/or PjBL and district-mandated curricula. Others addressed this issue by educating their peers by conducting professional development for their colleagues and administrators.

Telling teachers to change how they teach is not always successful. Experience is often the best teacher. With their willingness to apply PBL and PjBL in their own classrooms, educate their peers, debate with their administrators, and make PBL and PjBL fit with district mandates, the teachers in our study were committed to transforming pedagogy.

Limitations and Future Research

We must be mindful of the methodological limitations when considering the results of the study. One of the limitations was that we relied on volunteers to complete the online-structured interviews as well as the in-depth follow-up phone interviews. The survey was sent out two times and a total of 50 teachers responded. It is possible that if we had sent out the survey more than twice, we would have received a greater response. In addition, because 45 out of the 50 teachers who responded to the interviews indicated that they used PBL and/or PjBL, the results might be skewed toward those teachers who are using PBL and/or PjBL. However, 27% shows a significant shift in pedagogy considering the obstacles that teachers face in an era of high-stakes achievement tests and increased pressure for accountability. Further research is needed to show the benefits to students as a result of inquiry-based methods to justify a long-term commitment to PBL and PjBL.

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Sharon Dole is a professor of special education at Western Carolina University in Cullowhee, NC, where she coordinates the gifted education program. She completed her Ph.D. in special education at the University of Georgia with concentrations in learning disabilities and gifted education. Her research interests include pedagogies for deep learning, online course design and instruction, creativity, social and emotional needs of adolescents, and teaching diverse students. Correspondence concerning this article should be addressed to Sharon Dole, Western Carolina University School of Teaching and Learning, Killian 203C3, Cullowhee, NC 28723; dole@email.wcu.edu.

Lisa Bloom is a professor of special education at Western Carolina University and directs the special education programs there. She earned her Ed.D. from West Virginia University in 1989. She is the author of the text, *Classroom Management: Creating Positive Outcomes for all Learners*. Her research interests include creativity, social and emotional needs of learners, culturally responsive teaching, and classroom management.

Kristy Kowalske completed her Ph.D. in educational psychology and instructional technology specializing in gifted and creative education at the University of Georgia. She works as an adjunct professor for Western Carolina University and has been a teacher of middle school students for 17 years. Her interests are flow in the classroom, problem-based learning, growth mindsets, mindfulness, and spiritually gifted students.