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Problem Based and Studio Based Learning: Approaches to Promoting Reform Thinking among Teacher Candidates

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ABSTRACT

Problem based learning (PBL), which originated in medical schools in the 1960s, and studio based learning (SBL), which can be traced to apprenticeship designs of the Middle Ages, are pedagogies that are now being utilized across various disciplines of study. PBL is premised on the idea that when students independently research issues related to a problem and then reconvene in a large group to analyze what has been discovered about the issues, the students collectively learn more and learn more deeply about the problem under scrutiny. SBL is similar to PBL with a primary exception being that the learning occurs within the shared learning environment of a studio. This paper reports the findings of a study of the integration of PBL and SBL into a teacher education program. Three cases are presented that support the premise that PBL and SBL can serve as catalysts to reform thinking by teacher candidates.

Introduction

Problem and studio based learning are similar teaching-learning models that are beginning to be embraced across various fields of study as optimal strategies for producing articulate thinkers. Problem based learning (PBL) is described as focused,

experiential learning; a minds-on, hands-on model organized around the investigation and resolution of messy, real-world problems and authentic experiences; a means of fostering active learning; supportive of knowledge construction; a technique that naturally integrates school learning and real life; and an approach to learning that embraces the state and national standards of professional educational organizations (Torp & Sage, 2002). Studio based learning, though similar to PBL, has its own unique definition. Boyer and Mitgang (1996) explained that Studio based learning (SBL) is "reflective… design project centered… master craft-person supervised… group size varied (ranging from groups of 20 all the way down to pairs which move freely and change sizes frequently at the learners' will to learn)… discussion intense… individual project driven… highly integrated across multiple knowledge elements of the profession being practiced… Studio Based … and fostering of the learning habits needed for the discovery, integration, application, and sharing of knowledge over a lifetime" (p. xv-xvi). These models of teaching provide educators with innovate instructional strategies that provide students opportunities to engage in relevant, authentic learning in a school setting.

The PBL approach to teaching and learning originated in medical schools in the 1960s (Savin-Baden & Major, 2004). Dismayed by students' general passivity toward learning and boredom and disenchantment with medical school until the point of residency, a committee at McMaster University was the first to redesign the school curriculum with Problem based learning (Evenson & Hmelo, 2000) and other medical schools followed. Much like the reforming of medical schools with problem based learning, Lee Schulman of the Carnegie Center for the Advancement of Teaching suggested the reforming of teacher education with Studio based learning techniques (Schon, 1985). Now twenty plus years later, current research indicates that learners who study in problem and studio based case driven environments perform equally well or better on standardized measures. The research further shows that students who engage in PBL and SBL activities exhibit superior performance in making trade-specific proposals to solve problems or to design solutions. The following discussion presents the history and transformation of problem based learning to studio based learning. Models of cases used in studio based and problem based learning are discussed.

Comparing Problem and Studio Based Learning

Born some four decades ago in an effort to reform teaching and learning in medical schools, PBL has found its way into American popular culture as seen practiced by the Emmy award-winning British actor Hugh Laurie on the Fox Network television series *House.* In the weekly series, Laurie's character, Dr. House, is shown guiding his fellows through the steps of PBL – defining a problem, determining what is known, posing questions about what is not known, identifying issues connected to the problem, conducting research to learn about the issues connected to the problem, proposing potential solutions to the problem, and, ultimately, reaching a consensus and conclusion as to which solution is likely the best solution to the problem. While the entertaining program makes for popular T.V., it also provides a subliminal educational message to

viewers about how problems, not just medical problems but problems of many kinds, may be solved.

Similar to the PBL example shown in the teaching scenarios on *House*, SBL guides learners into behaving as practicing professionals. SBL uses design cases instead of problem cases that are filled with multiple ambiguities and which lead each individual designing learner to multiple, scientifically accurate design proposals that vary in artistic expression. PBL and SBL are similar in that they both are case driven; both require a master-apprentice relationship between teacher and learner; both entice learners to lead their own inquiry; and both allow for a proposal, critique, iterate again procedure before adequate solutions can be offered. As generally practiced, however, significant differences in PBL and SBL center around the places where learning occurs; the iteration timeframe; and the nature of the propose-critique-iterate-process.

The Learning Places of PBL and SBL

While PBL has been transferred beyond medical schools into classroom spaces that look much like traditional classrooms, SBL primarily takes place within the shared learning environment of a studio. The physical space of a studio provides a dedicated, collaborative workspace where students collaborate with experts (Schön, 1985). Since the students spend much of their time learning about and designing toward the ends of teacher-crafted cases that might be encountered by professionals in practice, the studio learning space is an essential part of the SBL experience. The studio space, where each student has a reserved, personal, learning area in which to respond individually to cases, is a core element of the learning model. The studio engages learners in a discursive collaboration. In SBL, learners talk to each other as much as or more than the teacher talks to the learners. The discourse is viewed as part of the proposal making or design process. The studio space holds student work desks, tables, resource storage, wall space for pin-ups, and group gathering areas, and the arrangement of these spaces changes daily, even hourly at times, during learning engagement. SBL demands for the learning space to change to encourage discourse and student inquiry beyond the Socratic teacher questions-students response patterns typically used in PBL. By its nature, a studio is messy—in a sort of functional disarray that signifies learning is occurring in a messy business way.

In SBL, the studio extends beyond the designated workspace into environments specific to the field where intense study of design takes place. Like apprentices, students who study in an SBL learning environment travel to see the great works of their discipline. So while the studio in SBL primarily means the space inside an actual design studio, it also manifests itself as the shared learning environment in field studies and real-world environments. At the heart of the difference between the learning places of PBL and SBL is that while PBL can be effectively achieved by having learners remain in a traditional classroom setting where they imagine scenarios of the problem case, SBL requires that learners travel in real time or virtually to the places of professional practice where design cases exist.

Iteration Timeframe

In SBL, the case is usually described in one very brief sitting, with or without a handout that presents the case. Learners immediately begin their own inquiry engaging in simultaneous discourse between and among learners as well as teachers. Discourse begins the process of iteration. This discourse begins immediately or very shortly after a case is introduced. In Figure 1, a time-content continuum is represented to show how students begin to master field-specific content while engaging in the proposal process. Over time, students engage and reengage in content using their learning to offer better and deeper iterations of their design proposals for continual critique by peers and teachers (See Figure 1).

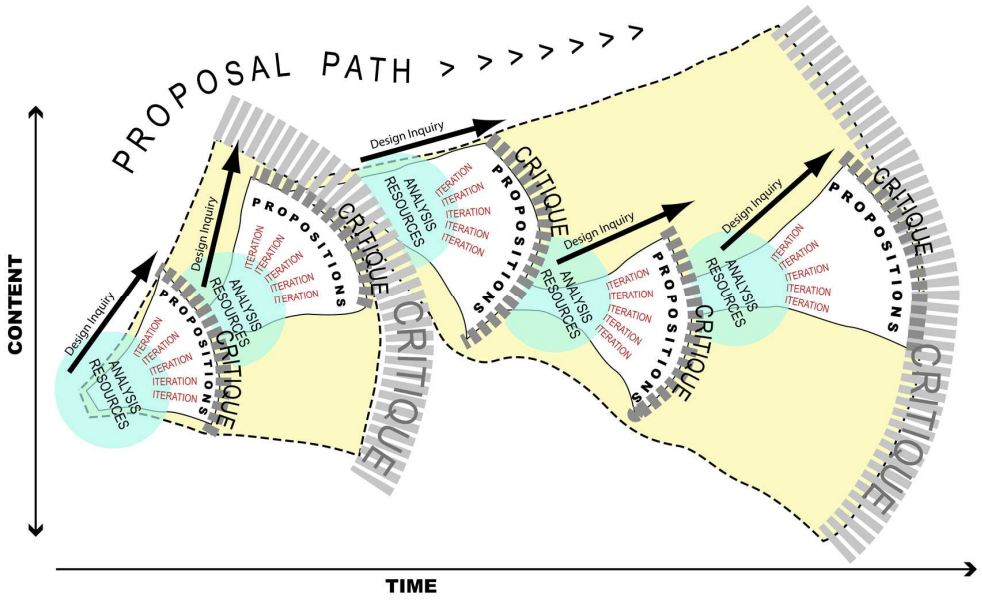

Figure 1. Proposal path during a studio-based learning case. (Monson, 2007)

As practiced in various settings, PBL functions in much the same way as SBL but with fewer and less frequent instances of proposal making and critique. Similarly on iteration timeframe, both the PBL and the SBL models engage learners in the same sort of time-content continuum. In contrast on iteration timeframe, learners in a PBL environment begin iteration later in their inquiry process than do learners in an SBL environment. Though little research has been done on SBL, anecdotal evidence indicates that SBL requires students to begin to design proposals as solutions to cases much earlier and to critique and iterate their proposals more frequently than students working in a PBL environment. The key difference is that while early and multiple iterations by students are possible with PBL, they are necessary in SBL.

The Nature of the Propose-Critique-Iterate Process

Critique is central to instruction in an SBL environment. Once a case has been provided to learners and the learners begin the inquiry and iteration process, critique simultaneously begins. As learners talk about their ideas of design solutions to the case, others question their design ideas. This is part of an informal critique process called desk critique or desk "crit" for short. As learners move along the time-content continuum of understanding, they begin to self-define their role to be one of finding out, that is, seeking out information from sources beyond the teacher present in the studio. Iteration begins immediately, is generative, and is on going until a final jury or formal critique of designs has taken place.

In PBL, students behave much the same way but are provided a framework for and more detail about the case in question. In addition, PBL can involve a process called progressive disclosure, which allows for the teacher to provide layered, case-specific information to the students. This is a tool that can be helpful when learners meander or become stagnant in their problem solving. Typically, though not exclusively, PBL solutions converge toward a set of more correct and accurate responses the teacher desired or anticipated from the outset of the case inquiry process. Conversely, the SBL teacher concedes to possessing fewer absolutes about the case trajectory. In SBL, the learners' proposals traverse during the propose-critique-iterate process in a divergent manner toward multiple, equally accurate design proposals. It follows that as the proposals by students will vary widely so too the responses to SBL cases will vary widely. In fact, it is reasonable to assume that any number of acceptable designs might be generated by a group of SBL students. This is generally not true with PBL cases. While there may be more than one reasonable solution to a PBL case, the "best" solutions are generally more obvious and fewer in number that those in SBL.

Problem Based Learning as a Philosophy of Teaching

The Center for Problem-Based Learning described PBL as "apprenticeship for real-life problem solving" (Stepien & Gallagher, 1993, p. 26). It is a constructivist philosophy of teaching and learning that encourages students to work cooperatively in a learning environment to uncover solutions to problems. As an instructional model, PBL is premised on the idea that when students independently research issues related to a problem and then reconvene in a large group after the period of independent research to discuss and analyze what has been discovered about the issues, the students collectively learn more and learn more deeply about the issues and the problem under scrutiny. After its piloting at McMaster, the PBL approach spread to other medical schools, and in the mid-1980s it began to be used in other teaching settings, across disciplines, and in varied professions (Evenson & Hmelo, 2000). It can now be seen used at all levels of schooling and has found a place in secondary classrooms (Lambros, 2004). In classrooms where PBL is employed, teachers function as facilitators of learning rather than as depositors of knowledge (Savin-Baden, 2003). In some classrooms, entire courses or units of study are built around PBL, while in other classrooms post-hole problems (i.e., short problems) are

used only occasionally (Stepien & Gallagher, 1993). With either practice, students are provided PBL cases that are designed to force them to ask questions, to think inquisitively, to reason analytically, to evaluate critically, and to create solutions to real world problems. Implicit outcomes in PBL are the development of higher order thinking, the improvement of written and verbal communication, and the refinement of interpersonal skills; all of which are necessary if students are to become productive and proactive lifelong learners.

A small but growing body of research addresses the use of PBL in graded classrooms, and the findings of a number of studies have indicated an array of positive effects of using PBL at the secondary level. For example, in an experimental study of tenth graders conducted by Sungur, Tekkaya, and Geban (2006), the group of students taught using PBL showed statistically significantly greater gains in both academic achievement and performance skills than the control group, which was taught using traditional means of instruction. Another experimental study, conducted by Tandogan and Orthan (2007), revealed that seventh graders who were taught using PBL showed not only an increase in academic achievement, but also more positive attitudes toward the content studied and greater conceptual development than students in a control group who were taught with traditional teaching methods. Another study, which was conducted at a secondary school for gifted students, found that when compared with the traditional lecture method, PBL resulted in greater understanding and retention by the students (Dods, 1997). And, importantly, in a study of students' perceptions toward PBL, it was discovered that students like PBL – they like its active nature, the relevancy it promotes, the variety it provides, and the group work it requires (Goodnough & Cashion, 2006).

Studio Based Learning as a Catalyst for Lifelong Learning

Lackney (1999) traces the roots of SBL from the Middle Ages when artists studied under masters to learn a trade. During the Paris Beaux Arts movement in the early 1900s, design students worked under the tutelage of a teacher-mentor to respond to a design case by "doing" the work of a professional artist or designer. The Beaux Arts era was marked by a competitive climate between students during which performance was often based on loose standards of various teachers' intuition and good taste. Juried reviews were a part of this early studio learning model. Later influences on SBL came from the German Bauhaus movement when instruction took a turn toward the practical more technical aspects of design. Modern SBL is marked by design cases, planned and impromptu lectures from experts, desk critiques from peers and teachers, preliminary and final juries, and exit interviews.

SBL seeks to provide students with technical learning during precisely the optimal learning moments that are fostered by their working in the common studio spaces under the mentor's guidance. The studio teacher is a practicing professional or one with practical experience who serves as a mentor for extended learning periods. In addition to mentoring, the teacher is a living example of how to behave as a design thinker. Students are influenced by the teacher's design-thinking lens, and this informs and influences their emerging professional selves. The design cases presented are extended in length and are

road and deep enough to hold learners' interest and require inquiry over long periods of time. While engaging in the design work to respond to the case, teachers engage in discourse with students about the models and process of designing. Communal cohesion and camaraderie between and among the students and teachers is characteristic of SBL environments.

Communication and community are critical elements of SBL. Attoe and Mugerauer (1991) interviewed 20 award winning studio teachers to gather a thematic grouping of good studio teaching qualities. The results revealed that good studio teachers talk a great deal to their students and frequently engage in Socratic dialogue which is typified by critical questions and reflective discussion that demonstrate clear understanding of a discipline. SBL is about instilling life-long learning habits of discovery, community, integration, application, analysis, synthesis, and evaluation. Particularly impressive is the length of time committed communally to design tasks. Commitment to design tasks for many consecutive hours over weeks and months provides an important community-building feature that is integral to SBL (Boyer & Mitgang, 1996).

Embracing Problem Based and Studio Based Learning

When embraced by educators, PBL and SBL can serve as agents to revolutionize what happens in classrooms. The roles of teachers and students change; the priorities set for teaching and learning change; and the ways teachers and students think about education change. The challenge in promoting the use of PBL and SBL, therefore, lies in educating teachers in its value and practice. To this end, a federally-funded project was developed to provide training to practicing collegiate and pre-collegiate instructors interested in learning about and implementing PBL and SBL in their classrooms. In recognition of the importance of introducing PBL and SBL to not only in-service but to pre-service teachers as well, three university professors who participated in the training devised a plan to integrate PBL and SBL into the teacher education program in their college. Their experiences, presented herein in three separate case studies, offer promising techniques for using PBL and SBL to reform how teacher candidates think about student learning and how they approach the profession of teaching.

Methods

This study reports the experiences of three university professors who participated in a project funded by the U. S. Department of Education that had as its goals the reform of teaching through intensive professional development in PBL and SBL to practicing educators in collegiate and pre-collegiate classrooms. During the multi-year project, training sessions were made available to faculty in high-need local education agencies, two-year college institutions, and four-year university settings. At the higher education level, training opportunities were made available to faculty in all schools and colleges.

Two levels of training were offered. Level I of the training provided opportunities for faculty members to learn the basics of PBL and SBL; to work in small, interdisciplinary groups to understand the methodological processes; to identify areas in the respective disciplines that would provide optimum opportunities to utilize the approaches; and to begin writing cases to use in specific courses. Facilitated by experienced PBL and SBL consultants, the group members collaborated for several weeks to plan and prepare for the implementation of the models into their courses. During subsequent months, the educators initiated the use of PBL and SBL in their classes, beginning by piloting the cases they had written during the training sessions. Throughout this phase of the training, project leaders provided support as needed to assist in the further development and refinement of subject-specific cases and the utilization of the models. Level II of the training provided selected faculty opportunities to develop facilitators' guides for their cases and to gain additional practice in the art of facilitation.

Integration of PBL and SBL into the Secondary Teacher Education Program

The mission of the College of Education that administered the PBL/SBL training project is to ensure the success of students by providing superior learning opportunities that are continually improved as society, schools, and technology change. Faculty in the College strive to achieve this mission by administering a teacher education program that produces high quality teachers. To this end, the goal of the secondary teacher education program is to provide teacher candidates the knowledge, skills, and dispositions required to become effective teachers in their respective fields of study. It was the collective belief of the faculty who participated in the PBL and SBL training that inclusion of the models in the teacher education program would enhance an already strong curriculum and potentially serve to promote reform-minded thinking among the teacher candidates in the program.

Teacher candidates in the secondary education program are required to complete a series of professional education courses during their junior and senior years of study. Capstone assignments that support the candidates' development of the knowledge, skills, and dispositions outlined in the Interstate New Teacher Assessment and Support Consortium (INTASC) standards, upon which the teacher education program is structured, are completed by the teacher candidates during each of the professional education courses. For each assignment, candidates produce artifacts that are included in the candidates' electronic professional portfolios. These artifacts provide evidence of the candidates' understanding and mastery of INTASC standards.

After determining that PBL and SBL would be integrated into the secondary program, faculty made the decision to designate the models as integral components in the planning and pedagogical content methods courses candidates complete. Faculty agreed to require candidates to engage in PBL and SBL activities that would provide evidence of mastery of INTASC standard four, which states: "The teacher understands and uses a variety of instructional strategies to encourage student development of critical thinking, problem solving, and performance skills" (INTASC, 1992, p. 20). It was also decided that the activities in the various courses would approach the PBL or SBL techniques in

uniquely different fashion. In some courses, candidates would be introduced to the models as a teaching strategy and informed of the research findings about its use. In some courses, candidates would be provided tutorials in the process of using PBL, and in other courses candidates would be given a learning case and instructed to work the case as a group to solve the problem or design a solution. Faculty quickly determined PBL and SBL to be valuable additions to their teacher education program, and they have identified a number of cases of how these approaches can effectively be used in a secondary teacher education program. An overview of three such cases follows.

Results

Case One: PBL in the Social Studies Methods Course

After completing the training in PBL, the secondary social studies methods professor involved in this study began modeling the use of PBL in the social studies senior level methods course. The professor introduces the strategy to the teacher candidates by having the students complete a PBL case using the six-step approach to PBL: (1) identification of the problem, (2) formulation of questions, (3) formulation of hypotheses, (4) identification of learning issues, (5) identification of potential solutions to the problem, and (6) selection of the best solution to problem. Timely, real world problems, such as illegal immigration, the federal tax structure, the national deficit, or environmental concerns, are used to demonstrate the appropriateness of PBL as a pedagogical tool for addressing social studies issues. While demonstrating the process and value of PBL, the professor places emphasis on the paradigm shift that is required to assume the role of teacher as facilitator rather than that of a depositor of knowledge (Kumar & Natarajan, 2007). The professor leads the pre-service teachers to an understanding that while more conventional methods, such as the lecture method, are acceptable and appropriate for certain content, less conventional approaches such as PBL are preferred approaches for other content.

After the teacher candidates are given opportunities to examine the rationale, processes, and implementation strategies applicable to using PBL in social studies classrooms, they are instructed in the art of writing social studies-oriented PBL cases. The pre-service candidates are then required to write original cases that may be used in secondary history, geography, government, or economics classrooms. Selected as a capstone assignment in the teacher education program, the cases written by the pre-service teachers are added to the candidates' electronic portfolios. The cases are designated as one of the artifacts that provide evidence of the candidates' understanding and use of a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills. The social studies methods professor has observed discernable changes in the ways teacher candidates who have experienced PBL think about teaching and learning in social studies classrooms. The reactions of the candidates to the prospect of using PBL range from near-frenzied excitement to outright fear. Upon its introduction, the vast majority of the teacher candidates embrace the very notion of PBL and the learning opportunities they envision it

providing students in social studies classrooms. These candidates frequently want to write more cases and want to "do" the cases. An excitement builds among the candidates as they anticipate the possibilities of using the cases they have written, and many of them later report the outcomes of their use during their internships.

As with most new or innovative teaching propositions, some candidates freeze when presented with the prospect of utilizing a teaching technique that is not duly prescriptive or that was not part of their personal educational experiences. These candidates are typically challenged by the requirement to write original PBL cases that are real world in nature, grade appropriate, and social studies-related. They get mired in worrying about potentially restricting factors such as time, testing, and administrative and curricular mandates. With encouragement and guidance, however, their reluctance subsides and they succeed in penning PBL cases that are creative and well conceptualized, and their thinking about teaching and learning begins to evolve. They recognize the need and desirability of real-world connections in what is taught and learned in social studies classrooms. This, in the mind of the social studies methods professor, constitutes reform-minded professional growth of the candidates, growth that is stimulated by their understanding and acceptance of PBL as an authentic and desirable means of teaching and learning.

Case Two: PBL in the Mathematics Methods Course

The secondary mathematics methods professor who completed the ACHIEVE training demonstrates PBL in her classroom in a hands-on, interactive way by having the teacher candidates complete a PBL case that requires candidates to respond to a problem situated in the context of a school math community. The case challenges students to devise a plan to educate a school community about ways to improve their math scores. The professor references the National Council for Teachers of Mathematics (NCTM) standards and the State Mathematics Curriculum Framework. Rather than providing answers to questions, the professor directs candidates to resources that will provide information needed to work the case.

The professor's primary learning goal for this PBL project was two-fold. First, candidates must be familiar with both national and state standards in mathematics. It is important for math educators to be able to understand the standards from a math perspective but be able to talk about it in terms understood by anyone. Additionally, candidates need to recognize the parallels between the national and state standards and explain the importance of implementing these standards in the classroom. Second, candidates need to explore the many resources available to them as they enter the teaching profession. These resources include current research findings as presented in professional mathematics periodicals, classroom materials, grants and other funding sources, and key professional leaders in the math education field.

Teacher candidates' recommendations have several consistent components. First, all groups accurately present the NCTM standards and the state curriculum frameworks and provide details on how the state curriculum frameworks are derived from the NCTM standards. Second, all groups provide a discussion on how the state frameworks parallel

the NCTM content and process standards. Conclusions from the groups vary slightly. For example, one group suggested that all math teachers be provided workshops that educate them on the NCTM standards and resources available through NCTM while another group recommended workshops that provide training in how to apply the process standards in high school classrooms. Overall, the recommendations are often simplistic but informational and plausible in nature.

Data collected from the PBL activity indicate the candidates adequately research and understand the importance of the standards to the math classroom. Comparisons between the state and national standards are made with candidates recognizing the important similarities between the two documents. Candidates self-report that they value the PBL process, and they acknowledge they spend more time researching the standards than if they were to have a traditional test. Feedback from a guest-grading panel indicates the candidates are progressing towards becoming math education professionals. As one panelist commented, "I was surprised at the level of sophistication the students possessed in talking about the standards. Their ability to articulate crucial points was equal to or better than that of students I train to become air force pilots." While evidence such as this suggests that the PBL experiences of the candidates are contributing to the development of teachers that know and understand the NCTM standards, the experiences are, moreover, producing candidates that appreciate the import of PBL and will likely replicate the process in their classrooms. Such theory to practice is essential for reform thinking and teaching.

Case Three: SBL in the Planning Course

After completing training in SBL, the teacher educator of the planning course began a learning community with professors and students in the university's School of Architecture. This professor made the larger university the learning studio for her teacher candidates and provided a case around which to design an electronic presentation of a positive learning places plan. Teacher candidates received brief instruction from the professor about their method of learning about effective classroom management and thereafter design a positive learning places plan that centers on (a) engaging instruction and (b) culturally responsive attention to diversity. Their plans are created using the studio based learning model used in the university's School of Architecture, which is located in the university's College of Art, Architecture, and Design.

The group begins with a visit to the School of Architecture where they enter inquiry into what does and does not make studio based learning a positive learning place that is well managed, focused on engaging instruction, and celebratory of all the diversities which exist therein. The teacher candidates begin to understand the core principles of classroom management, instructional planning, and cultural responsiveness as they inquire about the university's architect studios. Another essential component of the SBL experience is a daylong trip to gather examples of positive learning places. The day consists of a tour of an exemplary secondary school, which includes multiple classroom observations; interviews with students; separate panel discussions with teachers, parents, and students; and an exit interview with the school site administrator.

Teacher candidates engage in the SBL model of design as soon as the case is provided to them. By design, much ambiguity exists in the case and the process so that learners must become designers quickly. Iteration begins as soon as the positive learning places plan is introduced, making the propose-critique-iterate again process the chief mode of instruction and learning. Multiple iterations of positive learning places plans are offered for critique after which teacher candidates reiterate more effective designs. The teacher educator's role becomes one of directing teacher candidates to resources; providing mini-lectures—only when requested— in her areas of expertise; finding experts to provide topical mini-lectures; and organizing pin-up or semi-formal critique sessions where teacher candidates are required to offer serious, content-specific feedback to their peers on the positive learning places plans.

The students are initially anxious about the ambiguity in the work and begin quickly to feel responsible for their own projects. Iteration through idea sharing with teacher candidates and architect-peers begins during the early visits to the School of Architecture. Talks with the education and architecture professors encourage the learners to look to existing models as they design but to be personal and artistic as they iterate a positive learning places plan. Early designs are derived through discourse that generates outlines and storyboards that are then drafted into I-Movie or Movie Maker productions. The SBL designing of a positive learning places plan video is a capstone project for the course that requires teacher candidates to create scientific and artful designs of effective classroom management that attend to diverse learner needs.

Discussion

Most profound in this study was the commentary received from teacher candidates about their working within the PBL and SBL models. Interestingly, all teacher candidates who worked in both PBL and SBL models of learning preferred them to the more traditional models they had learned with previously, and all were impressed with the strengths of the models with respect to the power they offer to both teaching and learning. The findings of this study also indicate that while PBL can be a valuable asset to a teacher education program, SBL, as an emerging pedagogy, may have a broader, more transformative impact than PBL when used in teacher education preparation. Consequently, the focus of this discussion is narrowed to an analysis of selected candidate dialogue generated as a result of candidates' SBL experiences and implications of the dialogue.

Candidate dialogue one, excerpted below, provides important evidence that the student deconstructed a learning case to guide the design of her own personal inquiry about her teaching craft and the broader profession of teaching. She was making a connection between the work in a particular class and her entire program of study, in essence, seeing her program as a large studio for designing herself as a professional. She brought the learning resources she mentioned to class for her colleagues because she perceived herself to be part of a community engaged in study together. This quote provides important evidence that should spawn further study of SBL. This dialogue is excerpted from an email sent to her professor after class.

> I have a few questions about the demographics [of our case]. It says, "Bushyalla Reservation is a newly established Native American territory in the Mississippi Delta subsumed in Sunflower County." Does this mean that the students will be Native American? I remember from my Foundations class that some schools founded on reservations can only have Native Americans; is this true? If so can I assume that my students will be Native American? The reason I ask is because the values of Native Americans can differ from the norm of the Delta values. Also, I found the five core propositions for the National Board. I will bring a copy to class Wednesday.

This dialogue provided evidence that this student was making deep connections to course content. This is the kind of dialogue rarely encountered in classrooms where more traditional instruction is used and prior to candidates having been introduced to SBL. The three professors involved in this research observed that while the dialogue of candidates in classrooms where SBL was not used had meaning and application, it oftentimes lacked the depth apparent by comments offered by candidates immersed in SBL.

As further evidenced in candidate dialogue two, which follows, SBL not only allows candidates the latitude to think deeply about meaningful issues, it promotes a culture that encourages sophisticated, insightful, personal reflection that is rarely encouraged in other learning settings. This dialogue resulted when candidates were asked to email their professor about the most powerful impression they had after a field trip to the Civil Rights Museum in Memphis, Tennessee. One candidate said,

> The most powerful thing I saw was at the Martin Luther King Museum. I was impressed by the tenacity and emotion of the civil rights movement. The struggles that some people were willing to take. In particular, there was a large photo on the wall next to the lunch counter sit-in display. In the picture, there were two black people and one white person sitting at the lunch counter with a mob of angry white people behind them. The young white man had what appeared to be a milkshake poured over his head, and the two black people were looking at him. The look they were giving him appeared to be almost a "don't give up" look, the stern determination on their faces was particularly powerful.
>
> I thought about the absurdity of that situation, here were people, racists, willing to beat up people for a $2.50 hamburger. I wondered about that white guy in the picture with the milkshake on his head. He looked young, like me, white, like me, but he was willing to face adversity for what he believed in. I thought for a few days after that about whether if faced with a similar situation of injustice, I could make the same stand? Could any of us face the hostility that those people faced? I think ideally the answer would be that it isn't a matter of "could you," it's more a matter of "will you" or "you have to."

Certainly, classes take field trips as part of more traditional instructional models for learning and perhaps these trips inspire similar reflection. But in SBL, field experiences become a part of the discourse and iteration. In this instance, the fieldwork

component of SBL seemed to help this teacher candidate see a connection between civil rights advocates of the past and the ongoing need for individuals like him to continue to fight for social justice and equity today. The young man quoted here literally charges himself to be up to the challenge of facing racial hostility he may encounter. This is the kind of thinking inspired by the reflective design practices of SBL, and, therefore, use of this model should be investigated further.

Concluding Remarks

From this study a number of reasons can be derived for using PBL and SBL in a secondary teacher education program. The three cases presented herein support the premise that perhaps one of the greatest benefits of PBL and SBL is that both models allow teacher candidates latitude in their thinking about teaching and learning, a latitude that will likely translate into a greater propensity on their part to allow latitude in their future students' thinking and learning. Pre-service teachers who embrace the philosophies of PBL and SBL will be more willing to seek out learning opportunities for their students that are similarly innovative, engaging, and experiential. Furthermore, with a growing body of research that indicates that these models can have a number of positive effects on student learning and student attitudes toward learning across many disciplines of study, the use of PBL and SBL should be advocated in both teacher pre-service and continuing in-service education programs. The PBL/SBL training project as described herein serves as a successful professional development model for how training in the value and practice of these pedagogies can impact the thinking of teachers, teacher educators, and teacher candidates, thus having the potential for a powerful and positive multiplying reform effect at the classroom level.

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