Does Project Based Learning Help Foster Communities of Learners in Small US High Schools?

Jason Ravitz
Buck Institute for Education Novato, CA USA

Paper presented at meetings of the European Association for Research on Learning and Instruction. Amsterdam, NL. August 29, 2009.

Note. The author acknowledges the contribution of Shari Dickstein in preparation of this paper.

ABSTRACT

This paper explores the role of project based learning (PBL) in the smaller learning communities that have been established in many US high schools. It presents evidence that this approach to instructional reform more often than not supports the creation of learning communities. A national survey in the United States focused on teachers and schools that had invested in PBL as an instructional approach. We found that this is a hallmark practice among schools and teachers who are most involved in creation of learning communities. PBL thrives when teachers and students experience schools as learning communities, and, conversely, teachers and schools who use PBL more frequently see themselves as realizing the goals of learning communities for their students. Findings are based on data from 330 teachers representing four progressive reform networks, other small reforming high schools and small learning communities, and larger comprehensive high schools. Examples are provided to show that results appear to be independent of school type. The literature on learning communities frequently does not focus on instructional reforms, but our findings suggest that an explicit focus on pedagogy may be necessary for effective creation of learning communities; we see evidence that it easier to create learning communities among teachers than to create them among students.

Introducing Smaller High Schools

It is conventional wisdom that American high schools are in trouble, with reports of drop out rates of 50% or higher in major urban centers. This situation has been a focus of attention of US Department of Education, state and local government, educators and foundations. To address these concerns, a major thrust of high school reform in recent years has been the creation of small reform-oriented high schools. The Bill and Melinda Gates Foundation has invested over a billion dollars to help create small schools or small learning communities in dozens of districts and states.

Newly formed small schools often have the goal of creating "learning communities" for both teachers and students.[1] This goal is supposed to provide variety of benefits for teachers and students including opportunities and conditions for teaching and learning that are not feasible in large comprehensive high schools. Felner and colleagues (2007) found that successful learning communities thrive in smaller contexts, such as "small schools," "schools within schools," "houses" or "teams," or embedded in larger schools such as Ted Sizer's Essential Schools.[2] Small schools are designed to remove structural barriers that impede effective teaching and learning, and to meet students' needs as learners by personalizing

[1] For our purposes, "learning communities" and "communities of learners" are used interchangeably. However, "small learning communities" and "small schools" refer to the school size and structure.

[2] Felner et al. (2007) studied the personalization of schools through the institution of small learning communities as a result of a reform effort called "Project HiPlaces." The project views "performance and achievement as nested in a broader view of individual and contextually based competence, in which academic achievement is but one element of a larger set of competencies for which the student has inherent psychological motivation and need" (p. 211**).**

instruction and using more student-centered instructional pedagogies (Bomotti & Dugan, 2005, Feldman, Lopez, & Simon, 2005, Newell & Van Ryzin, 2007).

Though student-centered instruction is almost always a stated goal, the long term instructional implications of school conversion and start-up efforts across the US is unclear. Evaluations of these efforts have shown that while many smaller high schools have created a more personalized environment, instructional reforms have generally lagged behind structural and cultural changes (American Institute for Research & SRI International, 2005; Quint, 2006).

> It appears that small schools are fostering more personal and supportive contexts for both teachers and students…but they do not appear to be spurring increased instructional reform activity. . . .Instructional reform efforts, instructional practice, and academic test scores all appear the same at small schools as at other CPS schools serving comparable students. This represents a sizable shortcoming of the reform effort (Kahne, Sporte, de la Torre & Easton, 2006, p. 2-3).

In short, instructional reform is a weak link in the small school reform movement. This may, in part, reflect a failure to focus adequate attention on instructional practices in the literature on learning communities and small learning communities For example, the definition of learning community espoused by DuFour and Eaker (1998), an environment fostering mutual cooperation, emotional support, personal growth, and a synergy of efforts is void of the word instruction.

Focusing on <u>Instruction</u> in Communities of Learners

In *Transforming Schools into Communities of Thinking and Learning about Serious Matters*, Ann Brown (1997) notes that effective learning communities focus on creating classroom environments in which children "learn to think deeply about serious matters" (p. 399). She articulates particular instructional practices that lend themselves to this type of deep thinking (i.e., reciprocal teaching) along with a series of actions adults can take to engender a critical consciousness within students (i.e., introducing classes to big ideas and deep principles, leading students in a collaborative search for higher order relationships between concepts, and encouraging students to pool their knowledge in a "novel conceptualization of the topic"). Most of the literature on effective school-based learning communities, however, focuses minimally on the actual instructional practices of the teachers who work in such contexts, or the role of the students in the development of learning communities. Connections to *actual instructional changes in the classroom* as a result of structurally reforming the larger learning environment into a more community-oriented context are rare.

One study of learning communities that focuses on instruction is Felner, et. al., (2007). In their view, more personalized environments are intended to provide contexts of productive learning, where in student learning is interpersonal and takes place between students and teachers, and among peers. Their "critical components" to creating successful learning communities included empowering decision making at all levels and implementing deep, integrated standards based instruction. Accordingly, they state the "central focus across efforts is the creation of conditions that engage students, support learning, and enhance development" (pp. 209-210). This interpersonal approach to learning and instruction is often embedded within the Project Based Learning, or PBL model – where students and teachers are engaged continuously with the content and with communicating with one another, making the student an active, participating member in the "shaping of his/her own learning" (Felner, et al, p. 210).

What is PBL?

According to John Thomas (2000), project-based learning (PBL) is a model that organizes learning around projects that are defined as "complex tasks, based on challenging questions or problems, that involve students in design, problem-solving, decision making, or investigative activities; give students the opportunity to work relatively autonomously over extended periods of time; and culminate in realistic products or presentations," (p. 1). Maintaining fidelity to a PBL approach also necessitates that teachers be authentic in their approach to content and assessment, while also working to organize and manage projects in a way that supports student learning of explicit educational goals (Markham, Larmer & Ravitz, 2006). PBL classrooms are characterized by cooperative learning, reflection, and the incorporation of 21st century skills such as problem solving, technological literacy, negotiation, and communication, into students' daily work (Gallagher, Stepien, & Rosenthal, 1992; Hmelo, 1998; Thomas, 2000). Given the focus on instructional practice in PBL literature, we also know about the strategies and practices that teachers subscribing to PBL use in the classroom such as generating an authentic, or essential question to guide student inquiry; incorporating formative assessments into daily lessons to check students' progress and growth and inform future instruction; and emphasizing the importance of the *process* as well as the product when assessing student learning by weighing each equally in rubrics and other evaluative strategies.

According to the literature, PBL can be more effective than traditional instruction in increasing academic achievement (Mergendoller, Maxwell, & Bellisimo, 2007); for facilitating students' knowledge application (Dochy, et. al., 2003; Koh, et. al., 2008); in helping students develop a deep understanding of content (Boaler, 1997); and in helping students become more adept at integrating and explaining concepts (Schwartz & Martin, 2004). PBL has also been found to increase student motivation, foster more positive attitudes toward subject matter, and boost student engagement in learning; improve students' retention of knowledge over time and their mastery of 21st-century skills; and increase students' achievement on state-administered, standardized tests. PBL has also been found to be especially effective with lower-achieving students (Gallagher, Stepien, & Rosenthal, 1992; Hmelo, 1998; Mergendoller, Maxwell & Bellisimo, 2003; Ravitz, 2008; Thomas, 2000).

PBL and Learning Communities

At times, the literature on learning communities paints a picture that supports the idea that reforming to include a more PBL oriented approach plays a critical role in establishing learning communities. A related reform involves building relationships outside the classroom, a key part of the "next wave" of learning community research according to Mitra (2009). Mitra notes that effective youth-adult partnerships encourage members to take on a variety of roles such as "critical thinker, a teacher, a learner, a peacemaker, a supporter, a facilitator, and a documenter," (p. 426).). These roles required for effective youth-adult partnerships (and learning communities) are not dissimilar from the types of group-based roles teachers encourage their students to take on in more project oriented, progressive-minded classrooms the types of classrooms learning community literature espouses as the norm

At the community college level, Perin (2003) explored the implementation of *integrated instruction* which emphasized faculty and student collaboration, group-oriented project based work, and an interdisciplinary approach to instruction. This work reportedly resulted in massive and deep cultural shifts for all involved stakeholders – faculty and students alike -- across numerous community colleges (Perin). Apparently, linking courses using interdisciplinary teaming strategies helped motivate students to read more, to improve and apply their skills and to develop a sense of community. Students interacted more with each other and supported each other's learning. There was also an increase in faculty motivation, thought to have derived from a greater opportunity for interaction and collaboration.

Perin's study provides evidence that changing instructional practice to be more project oriented, interdisciplinary, and student centered, critical elements to the PBL approach, helped to foster more successful learning communities for faculty and students. Similarly, Harada, Kirio, and Yamamoto (2008), found that PBL can contribute significantly to teacher collaboration because project-focused teaching encourages multi-disciplinary approaches and promotes collaboration. PBL drives the climate and relationships not only between teachers and students, but between the librarian/media specialist and the classroom teacher.

Some of the reform model literature focuses on creating smaller more effective learning communities via shifts in schools' structural and instructional *cultures* (Newcomer & Seaton, 2007, Newell & van Ryzin, 2007). These small schools focus on creating a positive cultural climate, in which the approach to instruction is quite purposefully project-based learning (PBL). In their study of EdVisions schools,[3] Newell & van Ryzin (2007) articulate four core concepts needed to develop positive learning outcomes, two of which are instructional in nature: "a student-centered democratic culture**;** *a self-directed, project-based learning program; the use of authentic assessment;* and teacher ownership and accountability," (p. 468, emphasis mine). A few additional studies highlight successful approaches to instruction found in small learning communities (Clausen, Aquino, & Wideman, 2009; Corcoran & Silander, 2009; Felner, et. al, 2007; Perin, 2003). These successful approaches included the presence of team teaching, group work in the classroom, and interdisciplinary approaches to teaching and learning.[4]

While a causal link between PBL and the fostering of successful learning communities is not always explicit, PBL is frequently a clearly articulated instructional approach *in* the communities in which the above research was conducted. Our study is not designed to answer the causal question, but address whether learning communities are thriving more or less where PBL is used, and vice versa, in different kinds of schools. We asked in this study: **Does project based learning help foster communities of learners in small US high schools?**

METHODS

Study Population

Our study population is US public high school teachers of core academic subjects – math, science, social studies and English – who had invested in PBL (by purchasing materials or attending workshops) or who worked in schools where there was a known investment in PBL. Based on sales of handbooks (Markham, Larmer & Ravitz, 2006), workshops led by our organization, and based on communication with partner school reform organizations, at least 5000 teachers were estimated to be in this population as of 2006.[5] This number included teachers in four reform model networks, in other small schools (such as those involved in district or state-level initiatives) and in larger comprehensive high schools. We were able to identify 2746 such teachers and randomly sampled 1568 using probabilities that varied by stratum (e.g., teachers in a specific state initiative or reform network). We obtained responses from 404 teachers, 33% of the sample after removing ineligible cases, and 36% after also removing recipients whose emails bounced.[6]

---

[3] EdVisions is an intermediary organization funded by the Bill & Melinda Gates Foundation to create and sustain small secondary schools that emphasize teacher ownership and student-directed learning.

[4] A "small learning community" is distinct from a 'learning community" in that the definition of is often defined by the size of the school, e.g., as schools with no more than 200 students (Newell & van Ryzin, 2007). Throughout the literature, successful learning communities were most often present in either small schools or in small learning communities that had been carved out of larger comprehensive high schools (Felner, et. al., 2007).

[5] The Buck Institute for Education is a non-profit organization based in Novato CA.

[6] See Ravitz (2008) for more information on sampling and response rates.

Baseline study & Instrument Development

Before we wrote our survey, we conducted secondary analyses of findings from a survey of small schools conducted by the American Institutes for Research and SRI International (2005) under the auspices of the Bill and Melinda Gates Foundation. We identified items that seemed to be related to project- or inquiry-based learning, resulting in an index with14 items (standardized alpha=0.86). Our analyses showed that this "PBL-related" index was correlated with a variety of school environment measures, such as coherence of leadership, teacher collaboration, and personalized support for students. These "school environment" measures were strongly correlated with each other (r=.50 or higher), and somewhat less strongly correlated (about .30) with the PBL-related index. This suggests that the more actively reforming schools were using PBL to a greater extent than others, but not in every case. On average, PBL was associated with school environment measures, but some schools had changed aspects of their environment without emphasizing PBL as much.

The survey instrument we developed and piloted in 2006 replicated the AIR index, borrowed ideas from other studies, and added more detailed items about PBL beliefs and practices. Additional topics include variations in teaching responsibilities, planning of PBL and assessments, technology use, equity of outcomes, etc. We also asked about school structure, demographics, and – most importantly for this paper -- teacher and student culture. . The survey was piloted with teachers in different kinds of schools using an approach similar to "cognitive interviews" (Desimone & LeFloch, 2004). Administration of the online survey used strategies recommended by Dillman (2000), with the addition of a $15 economic incentive for those who had not responded to the social incentive that was offered at first.

Measures

The important measures and categories we used from our study are described below.

School Types were based on teachers' characterization of their schools and include the following:

- "reform models" – participants in networks of reform model schools
- "small school start-ups" - newly formed schools not affiliated with a reform model
- "small school conversions" – unaffiliated small schools or SLCs converted from larger schools
- "larger comprehensive high schools"- the traditional larger, comprehensive high school

We excluded small rural schools which comprise their own category and for which we did not have a large enough sample.

Time spent using PBL was based on teachers' response to the following item: "For a typical student in this course, how much of their overall TIME was spent on project based learning?" scored on a 6-point scale (1 = none or almost none, 2 = less than ¼, 3 = about ¼, 4 = about ½, 5 = about ¾, 6 = all or almost all). PBL was defined as an approach to instruction that a) features in-depth inquiry, b) occurs over an extended period of time, c) is student/self-directed to some extent, and d) requires a formal presentation of results. When completing the survey, teachers were instructed to substitute inquiry- or problem-based learning for PBL in the survey items, if they preferred to do so, since these terms are often used interchangeably in practice (e.g., Barron & Darling-Hammond, 2009). There are other characteristics that we would like to see, but these were considered a minimum requirement. Teachers who said they did not teach like this were taken to the end of the survey and are not included in our analyses.

Teacher Climate was assessed using four items that asked teachers how collaborative their working environment was (e.g., how often they "had regularly scheduled meetings that focused on instructional

practices and students' learning"). Items were scored on a 0-4-point scale (0 = "never" 1 ="Rarely", 2 = "sometimes", 3 = "frequently", 4 = "all the time"). The index had a Cronbach's alpha of .86.

Student Climate was assessed using seven items that asked teachers how often their students experienced personalized instruction (e.g., formed close mentoring relationships with teachers or met individually to reflect on their progress) or showed pro-learning attitudes (e.g., "encouraged and supported their peers as learners"). Items were scored on a 0-4-point scale (0 = "never" 1 ="Rarely", 2 = "Sometimes", 3 = "Frequently", 4 = "All the time"). The combined index had a Cronbach's alpha of .88.

Additional characteristics of schools and teachers that represent important conditions for use of PBL in learning communities (or important characteristics of teaching in these communities) are also considered. These include team teaching, interdisciplinary teaching, school wide rubrics, group projects and oral presentations.

FINDINGS

The first set of findings addresses use of PBL in the different types of school in our study. PBL is used more frequently in the reform model networks and the small school start-ups. These schools are implementing learning communities as part of a systemic reform model that includes an emphasis on PBL.

Table 1. PBL Use, by school type

School Type	N	Percent of teachers using PBL more than ¼ of the time	Mean z-score on PBL use	S.d.
Large, Comprehensive High Schools	128	25%	-.68	.65
Conversion/SLCs (non-startup)	102	51%	-.35	.80
Startup Small Schools	63	52%	-.12	.98
Reform Network Schools	220	81%	.59	.89
Total	512	57%	.00	1.00

Mean differences are statistically significant, Anova, $p < .001$.

Table 1 shows the extent to which PBL is an important part of the reform network schools, used ¼ or more of the time by more than 80% of the teachers. It also shows that both conversion and start-up schools are using this approach to instruction twice as frequently as teachers in larger comprehensive high schools (51% or 52% compared to 25%).

The next set of findings concerns the prevalence of learning community characteristics in each of these school types. The learning community indicators were most frequently reported by teachers in reform model schools, followed by small school startups and then small school conversions. Indicators that seemed consistent with fostering learning communities are shown in the left hand column of Table 2, below. Mean z-scores are provided for each indicator by type of school.[7]

[7] These scores show the amount above or below the average teacher in the study, in standard deviations (overall mean = 0.00, overall s.d. = 1.00).

Table 2. Prevalence of Learning Community Indicators, by Type of School

Indicators of Learning Communities	Means Z-scores for… Large/ medium size	Conversion /non-startup	Start-ups	Reform Models
Teachers…				
had regularly scheduled meetings that focused on instructional practices and students' learning	-.22	-.21	.26	.17
took a major role in shaping the school's norms, values and practices	-.56	-.38	**.45**	.41
had instructional coaching or critical friends visits between teachers	-.54	-.04	**.43**	.25
were involved in school leadership, setting policies or making important decisions for the school	-.53	-.32	.28	**.41**
Teacher Climate Index (4 items, alpha=.86)	-.57	-.27	**.43**	.38
Students…				
met individually with me to reflect on their progress and receive support	-.60	-.16	.24	**.40**
formed close academic advising or mentoring relationships with me or another teacher	-.67	-.28	**.50**	.42
had an individual statement of their learning goals that they periodically reviewed with me	-.48	-.11	.18	**.31**
encouraged and supported their peers as learners	-.44	-.27	.22	**.35**
gave their best effort and made the most of opportunities to learn	-.22	-.30	.14	**.24**
demonstrated that they were striving for in-depth knowledge, not just superficial learning	-.33	-.28	.05	**.33**
made their own decisions about what to learn or how to learn it	-.42	-.36	.06	**.42**
Student Climate Index (7 items, alpha=.88)	-.60	-.33	.26	**.47**
Minimum number of cases	148	104	65	225

Note. Highest score is in **bold**. Mean differences were statistically significant, ANOVA $p < .001$. Overall Mean = 0.00 and S.d. =1.00.

Table 3. Correlations of PBL Use to Teacher and Student Climate Indicators, by school type

	Large, Comprehensive High Schools (N=128)	Conversion/ SLC non-startup (N=96)	Startup Small Schools and new campus SLCs, (N=63)	Reform Network Schools (N=218)	All Schools (N=542)
Teachers…					
had regularly scheduled meetings that focused on instructional practices and students' learning	-.11 (NS)	-.11 (NS)	.11 (NS)	.13 (NS)	.11**
took a major role in shaping the school's norms, values and practices	-.03 (NS)	**-.20***	.13 (NS)	.11 (NS)	.22***
had instructional coaching or critical friends visits between teachers	-.12 (NS)	**-.24***	-.04 (NS)	**.22*****	.18***
were involved in school leadership, setting policies or making important decisions for the school	.10 (NS)	**-.24***	.13 (NS)	.09 (NS)	.22***
Teacher Climate Index (4 items, alpha=.86)	-.05 (NS)	**-.24***	.10 (NS)	**.17****	.22***
Students…					
Met individually with me to reflect on their progress and receive support	.20*	.02 (NS)	**.23** (p < .07)	**.22*****	.35***
Formed close academic advising or mentoring relationships with me or another teacher	.08 (NS)	.03 (NS)	**.25***	**.19****	.34***
Had an individual statement of their learning goals that they periodically reviewed with me	**.25****	-.11 (NS)	**.31***	**.21*****	.31***
Encouraged and supported their peers as learners	.15 (NS)	-.13 (NS)	-.01 (NS)	**.33*****	.30***
Gave their best effort and made the most of opportunities to learn	**.18***	-.08 (NS)	.05 (NS)	**.26*****	.24***
Demonstrated that they were striving for in-depth knowledge, not just superficial learning	**.24****	.16 (NS)	.05 (NS)	**.28*****	.33***
Made their own decisions about what to learn or how to learn it	**.39*****	**.20***	.19 (NS)	**.27*****	.41***
Student Climate Index (7 items, alpha=.88)	**.30*****	.02 (NS)	.21 (NS)	**.34*****	**.43*****

*** p < .001, ** p < .01, * p < .05

A majority of the indicators of teacher culture in Table 2 were *just as prevalent* or more prevalent in "unaffiliated" small school start-ups as in the reform model schools. The teacher climate index score was, in fact, higher on average for small school start-ups than for the reform model schools (z=.43 vs. .38). In particular, teachers in start-ups schools were more likely to report having critical friends visits with other teachers in their school than teachers in the reform model schools were (mean z-score =.43 vs. .25, respectively).

The mean z-scores for student climate measures show that start-ups scored above reform networks on one item only– forming close academic advising or mentoring relationships. This was reported as often in start-ups as in reform models (z=.50 vs. .42). However, students giving their best effort, demonstrating a striving for in-depth knowledge and making their own decisions about learning were reported more frequently in the reform model schools. Finally, Table 3 addresses the relationships between PBL use and the student and teacher culture measures, overall and by school type. PBL is more closely correlated with indicators of student climate than teacher climate. For example, regular meetings among teachers and critical friends visits among teachers had correlations of less than .20 with PBL use overall, suggesting that these occur nearly as often without PBL as with. The overall index for teacher climate, based on four measures, was only correlated with PBL .22. Student climate indicators, on the other hand, were more closely associated with PBL use. The overall index for student climate was correlated with PBL use .43.

In reform model schools and large comprehensive schools we see a stronger positive correlation between PBL use and student culture ($r > .30$). In start-ups schools there were closer personal relationships reported when teachers used PBL more ($r > .23$), but no relationship to greater student effort, support for peers, etc ($r < .20$).

Negative correlations were only seen between PBL and culture indicators in the conversion schools. These indicate the learning community indicators were actually less present when PBL was used more often. The only statistically significant positive correlation with PBL for this group concerns students making their own decisions ($r=.20$, $p < .05$).

Along with aspects of teacher and student culture discussed above, additional characteristics of schools that were thought to be indicative of learning communities are shown in Appendix A Of these, only oral presentations were not strongly associated with PBL (shown in the first column) and participation in reform model schools (shown in the last row). These findings reinforce the notion that instructional reform requires more than getting teachers to collaborate, but substantial changes in the instructional culture of the school, as seen most frequently in the reform models. – does this work?

Summary

This paper examined project based learning (PBL) as an instructional reform that can support the creation of communities of learners. Our findings show that schools and teachers who are most realizing the goals of learning communities are also using more PBL than others, particularly in the reform model schools but to an extent in other small schools that have been created and in large comprehensive high schools.

Overall, PBL and creation of "learning communities" are mutually reinforcing. PBL is a central pedagogy in reform model schools and there is a strong relationship to indicators of "learning communities" in these schools and sometimes in other schools too. PBL may be helping to engage students, to personalize their learning, and to promote collaboration among teachers and student, even when we control for school type.

The reform networks use PBL more and report more of the cultural characteristics of learning communities, but even in large comprehensive high schools PBL is associated with a student learning climate that more reflects the principles of learning communities. *However, there are aspects of learning communities that do not require use PBL, as shown by the lack of strong correlations for some of the items (Table 3), particularly outside the reform networks* Particularly in the conversion schools (small learning communities carved out of existing schools) was there evidence that learning communities take place independent of PBL, and that PBL may in fact be hindering efforts to create learning communities. In these and other small schools, changing the climate for teachers does not always mean there is a corresponding change in the experiences of students. In this respect, *our findings confirm what the literature suggests -- teachers and schools can change their teacher climate, without necessarily changing instruction or their student climate.*

We also know from our survey data that in order for PBL to work optimally, its adoption as a framework for instruction should be *school wide***.** Our survey respondents who reported working in schools with a *universal commitment* to PBL were those most successful in implementing PBL in their classrooms. Not surprisingly, given the literature on small learning communities and the collaboration and sense of collective responsibility necessary to pay fidelity to the PBL model, the majority of respondents who used PBL taught in small schools, or schools they characterized as "small learning communities."

CONCLUSION

Most of the writing about the creation of learning communities in small high schools does not focus on classroom instruction. This is a mistake, for what a teacher does each day with students communicates expectations and reflects beliefs about what it means to create and sustain learning communities. The study reported here demonstrates that teachers who use project based learning (PBL) and who teach in schools that emphasize this approach to instruction are more likely to report behaviors among themselves and their students that reflect the ideals of learning communities.

Given the above, one might pose the question, "what comes first?" A school wide commitment to changing instructional approaches (i.e., implementing PBL) which then fosters the creation of a learning community? Or do we start with an existing learning community that in turn nurtures implementation of successful instructional reforms, like PBL? While we do not believe that the existence of either necessarily *begets* the other, there is indeed a case to be made that successful implementation of the principles of PBL is more likely to occur in the context of a whole school commitment to PBL, and that school wide commitments to instructional reforms are more likely to be present in the context of a learning community.

For now, we intend to base future work on the following conceptual propositions: 1) instructional reforms thrive in smaller, rather than larger, contexts (i.e., small learning communities) and 2) focusing on instructional reform, particularly PBL, is an important step to realizing authentic school-based learning communities.

REFERENCES

American Institutes for Research & SRI International. (2005). *Executive summary: Evaluation of the Bill & Melinda Gates Foundation's High School Grants, 2001-2004.* Washington, DC: Authors

Boaler, J. (1997). Experiencing School Mathematics: Teaching Styles, Sex and Settings. Buckingham, UK: Open University Press.

Bomotti, S. & Duggan, J. (2005). *Smaller Learning Communities: A Synthesis of Evidence-Based Research*. Washington, DC: MPR Associates. Retrieved from http://www.mprinc.com/products_and_publications/search.aspx?pubID=351

Desimone, L. & LeFloch, K (2004). Are we asking the right questions? Using cognitive interviews to improve surveys. *Education Educational Evaluation and Policy Analysis, 26(1),* pp. 1-22.

Dillman, D. (2000). *Mail and Internet Surveys: The Tailored Design Method (2nd Edition)*. New York: Wiley & Sons.

Dochy, R., Segers, M., Van den Bossche, P., & Gijbels, D. (2003) Effects of problem-based learning: A metanalysis. *Learning and Instruction, 13,* pp. 533-568

DuFour, R. & Eaker, R. (1998). *Professional learning communities at work: Best practices for enhancing student achievement*. Bloomington, IN: National Educational Service.

Feldman, J., Lopez, L., & Simon, K. (2005). *Choosing Small: The Essential Guide to Successful High School Conversion* . San Francisco: John Wiley & Sons.

Felner, R., Seitsenger, A., Brand, S., Burns, A., & Bolton, N. (2007). Creating small learning communities: Lessons from the project on high-performing learning communities about "What Works" in creating productive, developmentally enhancing, learning contexts. *Educational Psychologist, 42(4),* pp. 209–221.

Gallagher, S.A., Stepien, W.J., Rosenthal, H. (1992) The effects of problem-based learning on problem solving. *Gifted Child Quarterly, 36,* pp. 195-200

Harada, V., Kirio, C. & and Yamamoto, S. (2008). Project-based learning: Rigor and relevance in high schools. *Library Media Connection, 26(6),* pp. 14-16, 18, 20.

Hmelo, C. (1998). Problem-based learning: Effects on the early acquisition of cognitive skill in medicine. *Journal of the Learning Sciences, 7,* pp. 173-208.

Kahne, J., Sporte, S., de la Torre, M & Easton, J. (2006). *Small high schools on a larger scale: The first three years of the Chicago high school redesign initiative.* Chicago, IL: University of Chicago Consortium on Chicago School Research.

Koh, G. C-H., Khoo, H.E., Wong, M.L., & Koh, D. (2008). The effects of problem-based learning during medical school on physician competency: A systematic review. *Canadian Medical Association Journal, 178(1*), pp. 34-41.

Markham., T., Larmer, J. & Ravitz, J. (2004). Project Based Learning Handbook: A guide to standards-focused project based learning, 2nd Ed. Novato, CA: Buck Institute for Education.

Mayer, R. (2004). Should there be a three-strikes rule against pure discovery learning? *American Psychologist, 59(1),* pp. 14-19.

Mergendoller, J.R., Maxwell, N., & Bellisimo, Y. (2007). The effectiveness of problem based instruction: A Comparative Study of Instructional Methods and Student Characteristics. Interdisciplinary Journal of Problem-based Learning, 1(2), 49-69

Newcomer & Seaton. (2007). Beyond the diploma: Career technical education. *Leadership, 37(1),* pp. 30-32.

Newell, R & van Ryzin, M. (2007). Growing hope as a determinant of school effectiveness. *Phi Delta Kappan, 88(6),* pp. 465-471.

Perin, D. (2001). Academic-occupational integration as a reform strategy for the community college: Classroom perspectives. *Teachers College Record, 103(2),* pp. 303–335.

Quint, J. (2006). Meeting five critical challenged of *high* school reform: Lessons from research on three reform models. New York, NY: Author. Retrieved from http://www.mdrc.org/ publications/428/full.pdf

Ravitz, J. (2008). Introduction: Summarizing findings and looking ahead to a new generation of PBL research. *Interdisciplinary Journal of Problem-based Learning, 3(1),* pp. 4-11. Retrieved from http://docs.lib.purdue.edu/ijpbl/vol3/iss1/2

Schwartz, D.L., & Martin, T. (2004). Inventing to prepare for future learning: The hidden efficiency of encouraging original student production in statistics instruction. *Cognition and Instruction, 22,* pp. 129-184.

Thomas, J.W. (2000). A review of research on project based learning. San Rafael, CA: The Autodesk Foundation. Retrieved from http://www.bie.org/index.php/site/RE/pbl_research/29

Appendix A: Other indicators of learning communities related to PBL Use and School Type

		Means Z-scores for each type of school			
Indicators of Learning Communities	Correlation to % Time on PBL (N=498)	Large, Comprehensive High Schools (N=136)	Conversion/SLCs, non-startup (N=96)	Startup Small Schools (N=61)	Reform Network Schools (N=218)
School structure and policies included…					
School-wide rubrics for assessing student work across different subjects, grades, or courses	.26	-.50	-.22	-.10	.45
A structure supporting multi-age groupings of students	.24	-.41	-.33	.01	.41
Team teaching, teachers of different subjects assigned to the same course or group of students	.35	-.45	-.29	.11	.39
Academic course with the most PBL used…					
A flexible approach to content, depending on what students were doing	.41	-.49	-.26	.08	.38
Team teaching, with another teacher	.31	-.36	-.24	.18	.27
Interdisciplinary projects, internships, or service learning	.42	-.53	-.25	.21	.37
Student performance was assessed using…					
Group projects	.50	-.46	-.25	-.01	.41
Student peer reviews	.35	-.41	-.17	.06	.33
Students…					
orally present their work to peers, staff, parents, or others	.30	-.14	-.36	.26	.18

Note. All correlations and mean comparisons (ANOVA), $p < .001$. Overall Mean = 0.00 and S.d. =1.00.