PEABODY JOURNAL OF EDUCATION, 85: 290–312, 2010

ISSN: 0161-956X print / 1532-7930 online
DOI: 10.1080/0161956X.2010.491432

Routledge
Taylor & Francis Group

Beyond Changing Culture in Small High Schools: Reform Models and Changing Instruction With Project-Based Learning

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This study describes the status of small school reforms in U.S. high schools and contemplates their future. It asks how cultural and instructional reforms differ across school reform types. Analyses focus on indicators of teacher and student culture as well as instructional reforms including project-based learning (PBL) and other inquiry-related practices. Findings are based on data from a national survey completed by 395 high school teachers who were responsible for and had used PBL in core academic subjects. Study participants taught in large, comprehensive high schools; in schools that had converted to small learning communities; and in newly created small school start-ups. Some of these small schools and conversions were based on a reform model, and others were not. Teachers in reform model schools reported the greatest number of cultural and instructional reforms, followed by teachers in other small schools. Reform models were particularly strong on instructional reforms and student culture. In general, start-up teachers reported more success implementing reforms than teachers in conversion schools, and teacher culture was reformed much more often than student culture and instruction. These findings help shed light on how widely practices and conditions have spread throughout the broader small schools movement, and which of these (including extensive PBL use) only seem to flourish in schools that subscribe to a holistic reform model.

INTRODUCTION

The creation of small reform-oriented high schools has been a major thrust of high school reform in recent years. Smaller high schools are supposed to provide a variety of benefits for teachers and students including opportunities and conditions for teaching and learning that are not often found in large, comprehensive high schools. Small high school start-ups have been designed to help teachers personalize instruction and meet students' needs as learners. A number of large, comprehensive high schools have "converted" into small schools or small learning communities to remove the structural barriers that impede effective teaching and learning and to use more student-centered instructional pedagogies (Feldman, Lopez, & Simon, 2005). At a more basic

An earlier version of this article titled "The Prevalence of Exemplary Characteristics of PBL in Reforming High Schools" was presented at annual meetings of the American Educational Research Association, 2009.

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level, Viadreo (2009) argued that smaller schools can reap benefits simply as a result of teachers having smaller student loads and greater opportunity for one-on-one conversations.

Key Concepts

Progressive Reform Models

For purposes of this article, reform model schools are defined as schools that have organized themselves around a consistent school design model and that often affiliate with a central organization that supports the implementation of the reform models philosophy and practices and that form at least a minimal professional learning community across the network. Several model high school reform networks, including those in this study—New Tech High, High Tech High, EdVisions Schools, and Envision Schools—have set the pace for high school reform by establishing start-up and conversion schools based on their models. Other model-based networks that have a similar outlook but were not included in this study include Big Picture Schools network, which originated at the Annenberg Institute at Brown University (McDonald, Klein, Riordan, & Broun, 2003), and Expeditionary Learning/Outward Bound Schools as described by Berger (1996) and colleagues.

The models in this study build on high-profile efforts to promote student readiness for 21st-century life (Secretary's Commission on Achieving Necessary Skills, 1991), to create "break the mold schools" (Bodily, 1996) and pioneering efforts to create smaller more personalized schools in general (Cotton, 2001; Meier, 1995; Sizer, 1992). Many of these schools received major support from the Bill & Melinda Gates Foundation (American Institutes for Research & SRI International, 2005). School reform models also have emerged as a result of legislation and funding for comprehensive school reform initiatives that are intended to change "all aspects of schooling" (Desimone, 2002). The goals of many (not all) of these school reform models and the rhetoric for small schools in general, are "progressive" in the sense that they generally work against a standardized, mechanical view of curriculum and lean toward one that promotes critical engagement, interactive meaning-making, and self-realization in the context of real-world experiences (e.g., Clinchy, 2003; Feinberg, 1999). A key feature of the reform models in this study is that they have embraced project-based learning (PBL) as a central component of instruction in their models. Based on writings of reform model proponents, an explicit emphasis on PBL may be a key to progressive instructional reform smaller schools (Newell, 2003; Pearlman, 2002). The reform models in this study organize their schools' cultural and organizational practices to support effective use of PBL. They have a holistic design strategy, and they do not necessarily believe that schools can implement parts of their model ("à la carte") and still be effective.

Small School Reforms

Many small schools, charter schools, and small learning communities have sprung forth from the same roots as the progressive reform networks in this study. They have common origins, inspiration, and goals tracing back to earlier work by the New American Schools Design

Competition (Bodily, 1996), Coalition of Essential Schools (Meier, 1995; Sizer, 1992), and others. They subscribe to the principles put forth by the reform models and by research that supports smaller high schools in general, including striving for greater personalization and more meaningful learning opportunities (e.g., Cotton, 2001; Feldman & O'Dwyer, 2008). They have responded to calls for reform that emphasize how students can benefit when there is a climate of trust and that better relationships that support meaningful student learning (e.g., National Association of Secondary School Principals, 2004; National High School Alliance, 2005). Like the reform model networks, these new small schools and small learning communities are trying to change not just school structures but school culture and, ultimately, the approach to instruction and student learning outcomes.

Research has shown that although smaller schools appear effective at creating more personalized environments for teaching and learning, *instructional* reforms have lagged behind these structural and cultural changes (American Institute for Research & SRI International, 2005; Bomotti & Dugan, 2005; Cotton, 2001; Quint, 2006). Findings suggest there have been benefits as seen in measures of school culture, such as "program coherence" and "reflective dialogue," but few corresponding changes in instruction.

> 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, pp. 2–3)

Though student-centered instruction is almost always a stated goal, it is unclear how much instructional change has occurred as a result of large-scale school conversion and start-up efforts. The promise of instructional reforms may not be realized unless they are unambiguously placed in the foreground. As noted by the Study of Instructional Improvement (2010), any blueprint for school change must include "(a) an instructional design; and (b) a design for school organizational practices that encourage faithful implementation and productive use of that instructional design" (p. 3). Correnti and Rowan (2007) noted that effective instructional reforms "need to be clearly targeted at delimited curricular areas, built around clear and highly specified designs for instructional practice, and backed by leaders who work assiduously in local settings to promote implementation fidelity" (p. 328).

Lack of adherence to a particular model could be due to the level of commitment and funds required. The reform models in this study generally work with a few new schools at a time rather than undertaking district- or statewide conversions. In addition, many small school advocates have been reluctant to endorse a particular instructional approach, preferring to give schools and teachers autonomy to make the best decisions for themselves (Feldman & Ouimette, 2007) and to adapt innovations to their local setting or classrooms (Rowan & Miller, 2007, p. 254). As a result, schools and teachers often seem to choose reforms à la carte in a way that may not be sufficiently integrated to promote meaningful schoolwide instructional reform. PBL in particular may require a substantial level of commitment and focus if teachers are to overcome challenges related to professional development, time in the curriculum, effective use of performance assessments, and so on.

PBL

PBL is a constructivist-based instructional approach that is designed to support more engaged learning. This approach uses "projects" as vehicles to encourage student motivation and to provide a means for demonstrating and explaining what they have learned. This approach has much in common with problem-based or inquiry-based instruction, although there are subtle differences (Barron & Darling-Hammond, 2008; Savery, 2006). In practice, "many educators will refer to the same activity interchangeably as 'project-based' or 'problem-based' learning, or simply 'PBL'" (Mitchell et al., 2005, p. 40). All of these approaches attempt to promote academic rigor while promoting "soft skills" such as critical thinking, communication and collaboration (e.g., Trilling & Hood, 1999). They often encourage students to be responsible and resourceful for their own learning, to solve open-ended problems, and usually to create and present artifacts as demonstrations of their learning.

The approach to promoting academic rigor in PBL is different from other approaches such as increasing course or testing requirements (Education Week, 2008) or focusing on character traits within a disciplined environment that encourages students to "work hard" (Tough, 2006) to attain core knowledge standards. In PBL, academic rigor is promoted by giving students the opportunity to take on challenging, socially or personally relevant tasks within the context of supportive relationships (Van Ryzin & Newell, 2009). Arguably, students will work hard not just because of their positive relationships with teachers and a desire to get ahead but as a result of the quality of the assignments given by teachers. Researchers who have emphasized the importance of high-quality, PBL-like assignments include Mitchell et al. (2005), Newmann & Associates (1996), and Silva (2008).

Operational definition of PBL. For this study, PBL was defined broadly as an approach to instruction featuring (a) in-depth inquiry, (b) over an extended period, (c) that is student self-directed to some extent, and (d) that requires a formal presentation of results. Because terms are often used interchangeably in practice, teachers were instructed to substitute *inquiry-based learning* or *problem-based learning*, or any other term for PBL (only 17% said they did). This operational definition is less rigorous than the ideal, but it allows an examination of this general approach without raising the bar for participation too high. There are other characteristics that might contribute to effective PBL use, such as effective use of group work, scaffolds and technology supports, a connection to the local community, combining multiple subject areas, strategic use of direct instruction, ongoing assessments, and so on. Additional information about variations in PBL-related teaching are provided by Barron and Darling-Hammond (2008); Maxwell, Bellisimo, and Mergendoller (2001); Mergendoller, Markham, Ravitz, and Larmer (2006); and Savery (2006).

Evidence of PBL effectiveness. No two teachers implement PBL in the same way. This makes it difficult to define exactly what PBL is and then study PBL's effectiveness. Most research has involved problem-based learning in professional schools, notably in medicine, but this has started to change (Walker & Leary, 2008). What one can do is draw inferences based on a great number of studies that have focused on PBL of one kind or another. Taking these as a whole, it seems safe to conclude that this approach increases motivation for learning. For most important

outcomes (with the exception of short-term concept learning), PBL is as effective as traditional instructional approaches, and there are many studies that show PBL to be superior (Strobel & van Barneveld, 2008; Walker & Leary, 2008). Specifically, PBL type instruction has been shown

- to increase understanding of concepts and the ability to apply knowledge as measured by standardized tests of subject matter (e.g., Geier et al., 2008; Hickey, Kindfled, Horwitz, & Christie, 1999; Mergendoller, Maxwell, & Bellisimo, 2007; Walker & Leary, 2008)
- to enable students to remember what they have learned longer and use that knowledge in new situations (e.g., Dochy, Segers, Van den Bossche, & Gijbels, 2003; Schwartz & Martin, 2004; Strobel & van Barneveld, 2008)
- to enable students to learn how to work in groups, solve problems, and communicate what they have learned (e.g., Cognition and Technology Group at Vanderbilt, 1992; Gallagher, Stepien, & Rosenthal, 1992; Hmelo, 1998)
- to improve attitudes and motivation (e.g., Boaler, 1997)
- to be especially effective with lower achieving students (e.g., Geier et al., 2008; Hickey et al., 1999; Lynch, Kuipers, Pyke, & Szesze, 2005; Mergendoller et al., 2007)

Unlike "discovery learning" or "minimally-guided" instruction (Kirschner, Sweller, & Clark, 2006; Mayer, 2004), effective use of PBL requires extensive planning and professional development, a supportive environment, and tools and strategies for effective instruction (e.g., Hmelo-Silver & Barrows, 2006; Strobel & van Barneveld, 2008). It does not seem reasonable to expect teachers to learn about and use this approach to instruction in a substantial way without supportive school leadership and structures.

Despite growing interest in using PBL, this is not the same as making it a central and supported focus. Meaningful instructional changes related to PBL may not take hold unless they are adequately emphasized and supported by broader changes in school structure and culture. Effective use of PBL may require a coordinated set of reforms and practices, and knowledge of how to avoid being overwhelmed by a myriad of other issues. Some of the structures or capacity that may be present in reform model schools but lacking elsewhere include a schoolwide emphasis on PBL, teacher mentoring in PBL, a portfolio assessment system, schoolwide performance rubrics, and block scheduling (Ravitz, 2008). Because all teachers in this study used PBL as an instructional strategy to some extent, it is possible to examine how their relative success in doing so is mediated by their school context.

Research Questions

The vision for small schools across the country includes an overhaul of traditional school culture and is often accompanied by interest in PBL and and inquiry-based learning. The research questions for this study were as follows:

Across different school types, how do PBL-using teachers differ with respect to the following:

1. teacher culture (teacher collaboration, decision making, etc.)
2. student culture (student personalization and pro-learning attitudes), and
3. instructional reforms (PBL and inquiry-related practices)?

It is critical to examine how much teachers who have tried PBL in various small schools have (or have not) managed to re-create practices and cultural characteristics that are present in the reform model networks. These data can help researchers and practitioners understand what aspects of instructional reform appear to be most challenging in newly formed small schools. Even if teams of teachers in small schools decide to focus on PBL use, as many have, the lack of a model that informs all aspects of school design and focuses on promoting effective PBL use could seriously hinder their efforts.

METHODS AND DATA SOURCES

In the fall of 2007 the Buck Institute for Education gathered data from 395 teachers who were selected from a list of 1,500 teachers. The sampling frame was comprised of teachers who attended workshops, purchased products, or taught in schools or networks of schools that had invested in PBL-related practices. Participation in this study was limited to teachers who were responsible for student learning of academic subjects—math, science, social studies, and English—in public high schools and who had used PBL within the past year. Valid completed responses were obtained from approximately 35% of the sampled teachers (Ravitz, 2008). The communications strategy used in this study borrowed heavily from Dillman (2000), including making multiple contacts with a randomly sampled population and providing them a small incentive at the outset, in this case a $5 Amazon.com gift certificate, to promote good will. The study also offered a $15 gift certificate in subsequent mailings to encourage more responses. Although nonrespondents were sent study invitations via "snail mail," use of an online survey to collect data may have prevented infrequent Internet users from participating.

Responding teachers taught in a variety of U.S. public high schools—92 in large, comprehensive high schools, 129 in other small schools and small learning communities, and 174 in four different reform networks (New Tech High, High Tech High, EdVisions, and Envision Schools). Because teachers were sampled with a known probability a more accurate and representative sample can be constituted based on 524 weighted cases, with weights averaging 1.5 and ranging from 1.0 for the smallest strata to 4.0 for the larger strata. Ravitz (2008) provided the number of weighted and unweighted responses by sampling strata.

Survey Development

The survey for this study made use of items and analyses from the National School District and Network Grants Program National Evaluation (Spring 2005 Teacher Survey). This large-scale survey was conducted for the Bill & Melinda Gates Foundation by American Institute for Research & SRI International (2005). Gaertner and Shkolnik (2006) helped identify PBL-related inquiry items from the earlier survey (resulting in an index of 14 items, $\alpha = .86$) and provided baseline data for how small schools compared to others on this measure. The resulting survey, including many newly written items, was piloted in 2006, using methods similar to the "cognitive interviews" (Desimone & LeFloch, 2004). This process involved revising the instrument extensively until the questions seemed to generate a reasonable set of responses in both the reform networks and more

traditional settings. The next section describes how schools were categorized and the indicators used to measure different aspects of school culture and a range of instructional reforms.

Categorizing Schools

Teachers first identified their school as a small school (with less than 500 students), a small learning community (SLC) existing within a larger school, or a large or medium-size comprehensive high school. If they were not teaching in a larger comprehensive high school, they indicated if their school was or used to be part of a larger school and whether it was founded as a reform-oriented "start-up" school. The primary analyses for this article ignore these finer distinctions and focus on the three basic school types:

- Reform model schools—schools that are part of a network of reform model schools
- Other small schools—small schools and SLCs with less than 500 students that are "unaffiliated" with any particular reform model
- Larger or medium-sized comprehensive high schools

It is potentially important to distinguish between small high schools that were start-ups and conversion sites; start-ups tend to have more autonomy and fewer constraints due to existing school conditions (Feldman & O'Dwyer, 2008). However, this mapping was not easily applied given teachers responses. Some schools were considered start-ups by teachers, even though they were carved out of a larger school. These were treated as conversion schools. Because of coding difficulties, and because of limited data, comparisons between start-up and conversion schools (both within the reform networks and independent of them) are viewed as exploratory. Finally, the study removed about a dozen teachers in rural small schools that had been in existence more than 9 years. This decision was made because rural schools represented a distinct population of small schools and were not well enough represented to be included in the analyses.

Measuring School Culture

Indicators of the climate for teaching and learning addressed aspects of both teacher and student culture. In theory, these could be fostered independent of any particular instructional approach. For example, a review in Ravitz (2009) found that the definition of "learning community" is frequently void of the word instruction, suggesting it is conceptualized as an environment fostering mutual cooperation, emotional support, personal growth, and a synergy of efforts (DuFour & Eaker, 1998). Accordingly, the "cultural" indicators that follow do not specify an instructional approach either.

Teacher Culture

Indicators of teacher culture included answers to four questions about teacher collaboration within their school, participation in decision making, helping to shape the norms of

school, and support for each others instruction. The survey asked whether "Teachers at my school . . ."

- had regularly scheduled meetings that focused on instructional practices and students' learning
- took a major role in shaping the school's norms, values and practices
- had instructional coaching or critical friends visits between teachers
- were involved in school leadership, setting policies or making important decisions for the school

The average score on the four teacher culture items resulted in an index measure with standardized reliability $\alpha = .86$. Response choices were 1 (*never*), 2 (*rarely*), 3 (*sometimes*), 4 (*frequently*), and 5 (*all the time*).

Student Culture

Indicators of student culture for learning included seven items. The first four concerned personalization of instruction (or relationships with teachers), and the last three items addressed the presence of "pro-learning" attitudes among students (e.g., as discussed by Bishop, 2004). There was an empirical basis for treating these as two groups of items (factor analyses available from author), but a decision was made to explore differences on an item-by-item basis and to combine these into a single index with higher reliability than either subset of items would provide:

Last semester, how often did most of your STUDENTS do the following?

- Met individually with me to reflect on their progress and receive support
- Formed close academic advising or mentoring relationships with me or another teacher
- Had an individual statement of learning goals that they periodically reviewed with me
- Made their own decisions about what to learn or how to learn it
- Encouraged and supported their peers as learners
- Gave their best effort and made the most of the opportunities to learn
- Demonstrated that they were striving for in-depth knowledge, not just superficial learning

The average score on the seven items resulted in an index measure with standardized reliability $\alpha = .88$. Response choices were 1 (*never*), 2 (*rarely*), 3 (*sometimes*), 4 (*frequently*), and 5 (*all the time*).

Although they do not reference PBL directly, several of these student culture items reflect what are supposed to be exemplary characteristics of PBL. For example, students having an individual statement of learning goals, giving their best effort, and making their own decisions all seem to indicate a level of student responsibility. That students make their own decisions also suggests that instruction is organized around ill-structured tasks and encouraging peers suggests student collaboration. Each of these characteristics is considered a key characteristic of PBL by Savery (2006) and others.

These items clearly provide only limited indicators of school culture. They are based solely on teacher self-reports and do not address directly how schools are shaping students' identities as learners. The teacher culture measure is even more limited. It is framed somewhat administratively

and does not address the extent to which teachers actually go out of their way to help students or to improve instruction together. With the literature on professional learning communities (e.g., Dana & Yendol-Hoppey, 2008), there are many other components of teacher culture that could be considered, including details about the structure of teacher decision making, collaboration, and professional development opportunities. Nonetheless, these kinds of items are commonly used in research and provide a rough indication of cultural norms for teachers and students.

Instructional Reforms

Use of PBL

Now that cultural differences have been described, the next focus is on instructional practices. The first instructional reform indicator concerned the proportion of time spent on PBL. Using the survey definition just provided, teachers chose a "selected course" in which they were responsible for academic content learning and in which they used the most PBL. They then indicated approximately what proportion of time an average student spent conducting projects in this course (less than one fourth, about one fourth, about half, etc.). Teachers who did not use PBL in an academic subject (math, science, English, or social studies) were dropped from the study and not counted as valid responses. Originally there were other questions about the extent of PBL use, but the pilot study found, for example, that the number of projects was not a good measure of intensity and the estimated percentage of days PBL was used was correlated to such an extent ($r = .95$) with overall time spent that it was redundant and not needed.

Inquiry Practices

The survey used two questions from the National School District and Network Grants Program National Evaluation (Spring 2005 Teacher Survey). This survey was conducted for the Bill & Melinda Gates Foundation by American Institute for Research and SRI International (2005). These two questions consisted of 14 items that addressed instructional reforms as identified by Gaertner and Shkolnik (2006).

1. Last semester, how often did you use the following methods to measure student performance?
   - Open-ended problems
   - Portfolios of student work
   - Group projects
   - Individual projects
   - Student peer reviews
   - Hands-on demonstrations, exhibitions or oral presentations
2. Last semester, how often did most of your STUDENTS do the following?
   - collected, organized, and analyzed information and data
   - solved real-world problems
   - decided how to present what they had learned
   - evaluated and defended their ideas or views

- orally presented their work to peers, staff, parents, or others
- researched topics deeply enough to become subject matter experts
- worked on multidisciplinary projects
- participated in community- or work-based projects or internships

The response choices for both sets of items ranged 1 (*never*), 2 (*a few times*), 3 (*once or twice a month*), 4 (*once or twice a week*), and 5 (*almost every day*). The index for the combined 14-item measure was found by Gaertner and Shkolnik (2006) to be reliable in the AIR study (standardized $\alpha = .86$). In the current study's administration of the survey this measure was also reliable (standardized $\alpha = .88$).

The inquiry-related practices are consistent with exemplary PBL characteristics identified by Savery (2006), even though most do not explicitly reference projects or PBL. Features of instruction associated with PBL often include students solving ill-structured problems, conducting work that would be valued in the real world, learning in multiple disciplines, taking responsibility for their own learning, and collaborating (Savery, 2006). In the current study, the AIR inquiry-related index was strongly correlated to overall PBL use ($r = .54$, $p < .001$), with teachers who reported more use of PBL more frequently reporting many of the inquiry-related practices (Ravitz, 2008).

The baseline data from the 2005 survey indicated that schools designated as reform model schools and start-up schools scored significantly higher on the 14-item index than conversion schools, which in turn scored significantly higher than the comparison schools. Although not statistically significant, it also appeared that the reform model schools scored higher than start-up schools. In addition, the leadership and teacher cultural measures were somewhat independent of instruction, with measures of school culture such as "leadership coherence" and "student safety" being more strongly correlated with each other (e.g., correlations = .50) than with the inquiry-related practice index (e.g., correlations = .30). This provided support for the notion that school climate and instructional reforms are related, but cannot be equated. That is, they can and do operate independently of each other.

Data Analysis Strategy

Two views of the data are provided to compare the presence of reforms. The *prevalence* of cultural characteristics and instructional practices in each type of school is first discussed in terms of the percentage of teachers giving each response using single dichotomous criteria or "cut point" (e.g., what percentage reported a practice at least "weekly" or "monthly"). The *relative difference* in response is shown using effect sizes. These are more sensitive than percentage differences because they are based on a full range of scores (mean z scores, with overall $M = 0.00$, $SD = 1.00$.) These average z scores are presented in the tables below the percentages, indicating the prevalence of each reform; they can be used to estimate effect size differences and show differences from the overall average (controlling for means and standard deviations).

Statistical significance tests are based on analysis of variance comparisons. For the primary analyses using three school types and the exploratory analyses of indices for the five school types, statistical significance tests employed post hoc Bonferroni adjustments (SPSS one-way analysis of variance) to address the statistical significance for each comparison.

RESULTS

The first set of results focus on cultural differences for teachers and students. These findings are followed by analyses of instructional differences in the three types of schools. A final set of exploratory findings addresses differences between start-up and conversion schools in terms of both culture and instruction.

Teacher Culture Findings

There were differences in cultural indicators across the three categories of schools—reform networks, other small schools, and comprehensive high schools. Concerning measures of teacher culture, Table 1 shows that teachers in the reform model schools reported the most cultural reforms, followed by teachers from small schools and teachers in the larger comprehensive schools. The teacher culture z score for reform model teachers was .38 compared to .04 for the other small school teachers and −.60 for teachers in larger comprehensive schools.

Responses concerning teacher culture in "unaffiliated" small schools often resembled responses in the reform model schools. A nearly equal proportion of teachers said they had regularly

TABLE 1
Teacher Culture Indicators, Percents and Means by School Types

	School Types			
Teachers at my school at least "frequently"...	Comprehensive Schools[a]	Other Small Schools[b]	Reform Models[c]	All[d]
had regularly scheduled meetings that focused on instructional practices and students' learning[e,f]	62% (−.25)	68% (.00)	72% (.17)	68%
took a major role in shaping the school's norms, values and practices	42% (−.60)	72% (−.02)	82% (.41)	68%
were involved in school leadership, setting policies or making important decisions for the school	36% (−.55)	58% (−.06)	79% (.41)	61%
had instructional coaching or critical friends visits between teachers[e]	10% (−.56)	47% (.17)	42% (.25)	34%
Overall teacher culture index (4 items, $\alpha = .86$)	−.60	.04	.38	0.00

Note. Means are based on z scores with overall averages of 0.00 ($SD = 1.00$). N = least number of weighted cases per column. Unless noted, all mean differences are statistically significant (analysis of variance <.001).

[a]$N = 132$. [b]$N = 158$. [c]$N = 220$. [d]$N = 524$. [e]Insignificant differences between reform model and other small schools. [f]Insignificant differences between comprehensive schools and others (using Bonferroni adjustments for multiple comparisons).

scheduled meetings focused on instruction and instructional coaching visits. For example, the latter occurred "frequently" according to 47% of unaffiliated small school teachers, 42% of the reform network teachers, and only 10% of teachers in large, comprehensive schools. These data suggest that a more collaborative teaching culture can be developed in small schools without relying on any particular reform model. This is consistent with Kahne et al. (2006), who also saw cultural shifts in small schools.

Student Culture Findings

Concerning student culture, teachers in the reform model schools indicated that students had a very personalized and supportive peer culture. Table 2 suggests that the differences concerning *student* culture were larger than the differences in teacher culture. The student culture z score for

TABLE 2
Student Culture Means and Percentages by Type of School

	School Types			
Most of my students at least "frequently"...	Comprehensive Schools[a]	Other Small Schools[b]	Reform Models[c]	All[d]
Encouraged and supported their peers as learners	36% (−.42)	48% (−.10)	66% (.35)	52%
Formed close academic advising or mentoring relationships with me or another teacher	27% (−.63)	50% (.00)	68% (.42)	51%
Gave their best effort and made the most of opportunities to learn[e]	37% (−.19)	44% (−.16)	55% (.24)	47%
Demonstrated that they were striving for in-depth knowledge, not just superficial learning[e]	27% (−.30)	33% (−.18)	51% (.33)	39%
Met individually with me to reflect on their progress and receive support	14% (−.60)	40% (.00)	54% (.40)	38%
Made their own decisions about what to learn or how to learn it[e]	22% (−.42)	18% (−.19)	47% (.42)	31%
Had an individual statement of their learning goals that they periodically reviewed with me	11% (−.47)	11% (.00)	26% (.31)	17%
Student learning climate index (7 items, $\alpha = .88$)	−.57	−.12	.47	0.00

Note. Means are based on z scores with overall averages of 0.00 ($SD = 1.00$). N = minimum number of cases per column, weighted. Unless noted, all mean differences are statistically significant (analysis of variance <.01).

[a]$N = 132$. [b]$N = 158$. [c]$N = 220$. [d]$N = 524$. [e]Insignificant differences between reform model and other small schools using Bonferroni adjustments for multiple comparisons.

reform model teachers was .47 compared to −.12 for the other small school teachers and −.57 for teachers in larger comprehensive schools. This means the effect size difference between reform model schools and other small schools was .59 for student culture, compared to a .34 for teacher culture (Table 1).

Unlike for the teacher culture indicators, there were no student culture items for which there was "parity" between the other small schools and the reform model schools. The closest comparison seen in Table 2 was students frequently giving their "best effort," reported by 44% of teachers in unaffiliated small schools compared to 55% of teachers in reform model schools, but there was still a fairly substantial mean difference for this item (effect size = .40).

In terms of student culture, teachers in unaffiliated small schools outside the reform networks more closely resembled teachers in the large, comprehensive schools. As seen in Table 2, the reform models stood apart on several student culture indicators. For example, twice as great a proportion of teachers in the reform model schools compared to other schools said that students frequently made their own decisions about what to learn or how to learn it (47% vs. less than 20%) and had individual statements of their learning goals (26% vs. 11%). Reform model teachers also more frequently reported students striving for in-depth knowledge and having individual statements of their learning goals.

Summary

The comparisons shown in Table 1 and Table 2 reveal that in many small schools teacher culture is more changed (or more like the reform models) than student culture is. It seems to be easier for small schools to promote new kinds of interactions among teachers—such as having frequent meetings or classroom coaching—than to change the student climate for learning. The next section explores whether instructional practices are similarly difficult to reform, or how widespread PBL use and related inquiry practices have become in each type of school.

Instructional Reform Findings

This section looks at differences in use of PBL and related inquiry-related instructional practices. Table 3 clearly suggests that reform models are leading the way in terms of instructional reforms, especially PBL use, followed by the other small schools.

PBL Use

The first instructional reform indicator concerns how much academic teaching and learning time was spent devoted to PBL use. Almost two thirds of the reform model teachers (63%) said that they used PBL "about half" the time or more in an academic course, compared to less than one fifth (18%) of other small school teachers and only 6% of teachers in large, comprehensive high schools. Even though all the teachers in this study used PBL to some extent, it is clear that PBL is a hallmark of the reform model schools. This is consistent with evaluations of the Gates-funded small schools that found "among the schools in this initiative that reported efforts

TABLE 3
Overall Extent of PBL Use and Inquiry Practices

% of Teachers Reporting That . . .	Comprehensive Schools[a]	Other Small Schools[b]	Reform Models[c]
% of teachers using PBL "half the time" or more	6%	18%	63%
Overall TIME was spent on PBL in selected course, *z* score	−.66	−.28	.60
Mean *z* score on Inquiry Index, 14 items[d]	−.52	−.08	.40

Note. Means are based on *z* scores with overall averages of 0.00 ($SD = 1.00$). N = minimum number per column, weighted. Unless noted, all mean differences are statistically significant (analysis of variance <.01). PBL = project-based learning.

[a]$N = 132$. [b]$N = 158$. [c]$N = 220$. [d]Insignificant differences between reform model and other small using Bonferroni adjustments for multiple comparisons.

to implement a common pedagogy across all classes, project-based learning (PBL) is the most commonly cited instructional strategy" (Mitchell et al., 2005, p. 40).

Inquiry Practices

The second set of instructional reforms indicators involved inquiry-related practices identified by Gaertner and Shkolnik (2006). There were substantial mean differences in the overall inquiry practices index (Table 3). Table 4 provides examples of assessment practices that were considered inquiry related. For example, more model school teachers than other small school teachers reported assessing student using group projects (52% vs. 27%, ES = .58).

There were similar results for other inquiry-related instructional practices (Table 5). For example, a greater proportion of teachers in reform model start-ups than in other schools said students monthly researched topics deeply (55% vs. 34% or less) and conducted multi-disciplinary projects (64% vs. 42% or less).

Some of the inquiry-related practices in Table 4 were reported with nearly the same frequency in both reform model schools and other small schools—such as assessing students using portfolios of student work (48% vs. 44%, ES = .02), and using open ended problems (38% vs. 39%, ES = .08). As shown in Table 5, teachers in these schools also gave similar responses concerning students collecting, organizing, and analyzing data (83% vs. 84%, ES = .16), and evaluating and defending their views (75% vs. 80%, ES = .18), on a monthly basis.

Summary

Although a few instructional practices are reported similarly, overall the reform model teachers scored substantially higher not just on the PBL measure ($z = .60$) but also on the 14-item inquiry-related index ($z = .40$). Some of these instructional reforms, such as use of portfolios or open-ended problems for assessment are reported to similar extents with or without a reform model.

TABLE 4
Inquiry-Related Assessment Practices

Students Were Assessed Using . . .	Criteria	Comprehensive Schools[a]	Other Small Schools[b]	Reform Models[c]	All[d]
Student peer reviews	Monthly	26% (−.44)	47% (−.04)	60% (.33)	47%
Portfolios of student work[e]	Monthly	19% (−.37)	48% (.13)	44% (.15)	38%
Hands-on demonstrations, exhibitions or oral presentations	Weekly	23% (−.33)	31% (−.06)	46% (.26)	36%
Group projects	Weekly	18% (−.44)	27% (−.17)	52% (.41)	35%
Open-ended problems[e]	Weekly	22% (−.28)	38% (.15)	39% (.07)	34%
Individual projects[e]	Weekly	8% (−.35)	20% (.03)	35% (.21)	23%

Note. Means are based on z scores with overall averages of 0.00 ($SD = 1.00$). N = minimum number per column, weighted. Unless noted, all mean differences are statistically significant (analysis of variance <.01).
[a]$N = 132$. [b]$N = 158$. [c]$N = 220$. [d]$N = 524$. [e]Insignificant differences between reform model and other small schools.

Other instructional reforms, especially those seeming to involve PBL, such as "group projects", are reported much more frequently in the reform model schools.

EXPLORATORY ANALYSES

This final set of findings addresses differences between start-up and conversion schools, both within the reform models and outside of them. These data are helpful in clarifying which reforms seem to require a start-up or reform model school. Confidence in these findings is somewhat limited because model conversions came from only one of the reform model networks in this study, and unaffiliated start-ups came from just two of the sampling strata—a statewide initiative and a few California-based "affiliates" of one of the reform models. With these limitations in mind, the five types of schools used for exploratory analyses are as follows:

- Reform model start-ups—new sites that were established based on models
- Reform model conversions—schools that adopted reform models after "converting" or breaking up a large high school on an existing site
- Small, unaffiliated "start-up" schools—new start-up schools that are not part of a specific reform model network
- Unaffiliated "conversion" schools—small learning communities carved out of an existing school that are not part of a specific reform model network
- Larger comprehensive high schools—the traditional large or medium-sized comprehensive high school

TABLE 5
Inquiry-Related Student Assignments

Students at least "monthly" . . .	Comprehensive Schools[a]	Other Small Schools[b]	Reform Models[c]	All[d]
collected, organized, analyzed information and data	63% (−.28)	83% (.01)	84% (.17)	78%
evaluated and defended their ideas or views[e,f,*]	60% (−.12)	75% (−.06)	80% (.12)	73%
solved real-world problems[e]	57% (−.22)	65% (−.16)	83% (.25)	71%
decided how to present what they had learned[e]	54% (−.22)	70% (−.15)	82% (.24)	71%
orally presented their work to peers, staff, parents, or others[f]	56% (−.14)	59% (−.13)	76% (.18)	66%
worked on multidisciplinary projects	30% (−.49)	42% (−.17)	64% (.43)	48%
researched topics deeply enough to become subject matter experts[e]	31% (−.31)	34% (−.18)	55% (.32)	42%
participated in community- or work-based projects or internships	10% (−.45)	24% (.02)	34% (.26)	25%

Note. Means are based on z scores with Ms = 0.00, SD = 1.00. N = minimum number of weighted cases per column. Unless noted, all mean differences are statistically significant (analysis of variance <.001).

[a]$N = 131$. [b]$N = 158$. [c]$N = 218$. [d]$N = 507$. [e]Insignificant differences between reform model and other small schools. [f]Insignificant differences between comprehensive schools and others (using Bonferroni adjustments).

*$p < .05$.

Exploratory Analyses of School Culture

As indicated previously, reform model teachers reported reforms with greater frequency than teachers in the other small schools. However, a summary of index z scores for each of the five school types (Table 6) shows that unaffiliated start-ups were strong on measures of *teacher culture* (index z scores = .43, compared to .40 for model-based start-ups and .30 for model conversions). In fact, only small differences were seen in teacher culture between the two types of start-ups. Using examples not shown in the summary tables, in unaffiliated start-ups the greatest proportion of teachers reported frequent instructional coaching or critical friends visits (48% reported this compared to 44% in model startups and 33% in model conversions).

Table 6 shows a different pattern for student culture. There was less parity between the two kinds of start-ups. Teachers in model start-ups scored higher than unaffiliated start-ups on measures of student culture ($z = .60$ vs. $z = .26$). For example, 74% of teachers in reform model start-ups said students encouraged and supported peers frequently, compared to 59% of other small school start-ups. In addition, more than half (52%) of the teachers in reform model start-ups reported students making their own decisions about what or how to learn, compared to less than one third (31%) of teachers in other start-ups.

TABLE 6
Overall Index Scores for Five School Types

	Large Comprehensive	Small Schools			
		"Unaffiliated"		Reform Model	
		Conversion	Start-Up	Conversion	Start-Up
Index scores					
Teacher culture (4 items, $\alpha = .86$)	−.57	−.27	.43	.30	.40
Student culture (7 items, $\alpha = .88$)	−.60	−.33	.26	.08	.60
Inquiry-related practices (14 items, $\alpha = .88$)	−.21	−.06	.29	.13	.44
PBL use					
Overall TIME spent on PBL? (z scores)	−.68	−.35	−.13	.47	.64
% using PBL "about half" of the time, or more	5%	11%	31%	57%	64%
Minimum no. of cases	115	74	38	42	80

Note. The mean differences across all columns are statistically significant (analysis of variance <.001), however, many of the smaller differences between columns are not statistically significant using Bonferroni adjustments for multiple comparisons (available from author). Means are based on z scores with overall averages of 0.00 ($SD = 1.00$). N = minimum number per column, weighted.

Another finding is that conversions appeared to be less far along implementing reforms than start-ups. This was true for both reform models and unaffiliated small schools. Table 6 shows that among unaffiliated small schools there were major differences between start-ups and conversions. These were seen on both the teacher culture and the student culture indices (with effect size differences of approximately .60 for both). Among the reform model schools there was a big difference between start-ups and conversions in student culture, but no similar difference in teacher culture. Student culture index scores for reform model teachers averaged .60 for start-ups and .08 for conversions (ES = .52). On teacher culture, however, the difference between reform model start-ups and conversions was negligible (ES = .10). These findings suggest that conversions are more likely to make progress changing teacher culture than student culture, even with the benefit of a reform model.

Although conversion schools scored lower on the index measures than start-ups, they compared favorably to the larger comprehensive schools. Table 6 shows that teachers in unaffiliated conversions had higher average overall index z scores than teachers in larger comprehensive high schools, including in student culture (ES = .27) and PBL use (ES = .33).

Concerning *student* culture, unaffiliated start-ups compared somewhat favorably to reform network conversions (index z scores = .26 vs. .08, respectively). Teachers in small school start-ups that were unaffiliated with reform models more frequently reported that students formed close academic relationships with teachers (77% vs. 38%), met individually with teachers (52% vs. 41%), and encouraged and supported their peers as learners (59% vs. 41%). Based on these

student culture indicators, unaffiliated small school start-ups seem further along than the reform model conversions, suggesting the difficulty of changing existing school culture.

Summary

Earlier findings suggested that reform models overall have implemented "cultural" reforms to a greater extent than the other small schools, particularly when it comes to student culture. These exploratory analyses that were just presented suggest that it is conversion schools that have an especially hard time influencing student culture, even when they have the benefit of a reform model. Start-ups, on the other hand, have had some success changing teacher and student culture, even without a reform model. The next section turns to the key question of changes in instructional practices and whether teachers in the kinds of schools where cultural reforms are taking place have also succeeded in implementing instructional reforms.

Exploratory Analyses of Instructional Reforms

This final set of exploratory analyses focuses on instructional reforms for the five school types, including start-ups and conversions that were and were not part of a reform model network. As was the case with student culture indicators, it seems start-ups have been able to change what students experience more than conversions. Table 6 shows that teachers in reform model start-ups reported the most inquiry-related practices ($z = .44$), followed by the teachers in the other start-ups ($z = .29$) and then the model conversion schools ($z = .13$). Once again, teachers in conversion schools reported more reforms than teachers in larger comprehensive schools. Coupled with the previous findings, this suggests that compared to larger comprehensive schools conversions may be making a difference in changing both culture and instruction.

Teachers in model-based conversion sites reported reform practices more frequently than teachers in unaffiliated conversion sites. Table 6 shows a small difference in inquiry-related practices (ES = .19) but very large differences in PBL use (ES = .58), with 57% of reform model conversions reporting that they used PBL half the time or more, compared to just 11% of unaffiliated conversion sites. These data suggest that although unaffiliated conversions are realizing some reforms (e.g., compared to large comprehensive schools), the most successful ones in changing practice, particularly using PBL, are conversions that have been created based on a reform model.

Unaffiliated start-ups were relatively strong on a few of the inquiry-related instructional reforms. For several assessment-related reforms, they were "on par" with the reform model conversions and even with the reform model start-ups. Reforms reported with equal frequency in the reform model and unaffiliated start-up schools (approximately 40% each) included use of assessments based on student portfolios and open-ended problems. For each of these kinds of assessment practices a near equivalent proportion of teachers said they frequently used the practice. A few instructional practices were reported more frequently by teachers in unaffiliated start-ups than in the model conversions. Surprisingly, these included students participating in community-based projects or internships and working on multidisciplinary projects each month, Seeing greater use of these practices outside the reform models is surprising, given the less

frequent use of PBL overall. One explanation for these apparently contradictory results is that the operational definition of PBL and specification of a core academic course did not appear on the survey until after the general inquiry-related items. This means that the projects referred to in these inquiry-related practices may not have met this study's criteria for PBL (i.e., they may have been outside academic courses, may have lacked student direction, not required a presentation of conclusions, etc.). It is also possible the reform model teachers, because of their extensive reliance on PBL, have to focus on subject-specific academic projects, whereas outside of the reform models infrequent use of PBL (including outside of academic subjects) allows greater use of community-based or multiple-subject projects.

In contrast to the aforementioned findings, teachers in model-based conversion schools were stronger than unaffiliated start-ups on other inquiry-related instructional reforms, including some of those involving projects. The model conversion teachers were twice as likely as the unaffiliated start-up teachers to say students used PBL half of the time or more (59% vs. 31%, ES = .60). They were also more likely to report weekly assessment of students using group projects (49% vs. 31%, ES = .40) and monthly assessment of students using peer reviews (62% vs. 49%, ES = .49). These findings suggest the strong level of commitment to PBL in the reform model schools and that these schools have made progress incorporating PBL as a key instructional strategy even in their conversion sites.

Summary

Overall, instructional reforms are reported more frequently in the reform models than in the unaffiliated small schools, and more frequently in the start-up schools than the conversions sites. Reform models seem to be contributing to teachers' ability to carry out instructional reforms, particularly use of PBL, even in their conversion schools. To the extent that small schools outside the reform models are reforming instruction, it tends to be in start-up sites and to involve instructional practices other than full-blown PBL.

DISCUSSION

The results of this study seem to substantiate the findings by Kahne et al. (2006), who concluded that instructional reform has been lagging in small schools, despite evidence of some cultural shifts. The overall pattern of findings also mirror those reported by Gaertner and Shkolnik (2006), who reported that newly formed small high schools have implemented instructional reforms more than large comprehensive schools, but not as much as schools that are based on reform models, and that small school start-ups on balance seem to be further along in these reforms than conversions. The study's findings indicate that small schools designed without a reform model have made progress reforming teacher culture and incorporating some inquiry-related practices, but it is the reform model schools that are setting the bar for PBL use and transformation of student culture.

These results suggest that even if new schools have strong and committed leaders who are knowledgeable about research on characteristics of effective high schools (e.g., as defined by the National High School Alliance, 2005; Sizer, 1992, or others), they may need a holistic model to put this knowledge into action. Given the complexity of school change, most schools

probably lack vision and capacity at some level and could benefit from a prescription for change. Without a systemic model that provides guidance and ensures adequate focus on and capacity for instructional reform, this study suggests that small schools may continue to struggle with instruction.

Most schools (that are typically not model-driven start-ups) seem to have placed more emphasis or had more of an impact so far on teacher culture than student culture. It is possible these schools have intentionally decided to tackle teacher culture first and have a specific plan to tackle instruction later. It is also possible that this is an unintentional result of teacher culture being easier to reform than student culture.

A key question is whether there are valid reasons to try to change teacher culture before reforming instruction and whether teacher culture has to change before instructional reforms can be realized. There are little if any empirical data on how long instructional reforms should take, although Borman, Hewes, Overman, and Brown (2003) indicate "schools that implemented [comprehensive school reform] models for 5 years or more showed particular strong effects" (p. 125) on achievement. In the current study, unaffiliated conversions and start-ups had both existed for about 3.5 years, on average. In contrast, reform model conversions had been open for less than 2.5 years, on average, whereas reform model start-ups had existed for 5 years. This means that reform model start-ups may have had a "head start" compared to others in this study. In addition, the model conversions may not have had sufficient time to implement all the reforms and therefore teachers in these schools might be expected to be further along in another year or two.

In the end, it is clearly the reform models in this study that appear to provide a means for changing both the approach to instruction and student culture. Schools implementing a systemic model that specifies PBL as the heart of their instructional approach also reported more cultural changes and inquiry-related practices. Only the teachers in reform model start-ups consistently reported all types of reforms in this study. They reported more extensive use of PBL and more of the various inquiry practices. In addition, their average z scores for all culture measures were .40 or greater (Table 6).

The power of the reform model may be found in the unifying vision for instructional change, the external resources and the technical support to realize this vision, knowledge about how to focus on and prioritize changes that impact instruction and how to move past potentially overwhelming obstacles or distractions. The reform models in this study have given instructional change (and specifically PBL) at least as much weight as structural and cultural changes. As a result of this explicit emphasis on instruction as well as other changes, reforms may be orchestrated to produce a synergistic effect, that is, cultural changes may enable effective use of PBL at the same time that PBL reinforces positive changes in school culture. Outside the reform models, however, the role of PBL is often not made explicit or considered central to the success of small schools. Instead, there is an emphasis on teacher culture, certain aspects of student culture and on isolated instructional practices that may not meet the minimal definition of PBL.

There is clearly much more to learn about how teacher and student culture influence (and are influenced by) instruction. Ravitz (2009) reported that the student climate index was correlated to PBL use overall ($r = .43$, $p < .001$), in reform model schools ($r = .34$, $p < .001$), and in the larger comprehensive schools ($r = .30$, $p < .001$). However, no similar correlations were seen between teacher culture and PBL. This provides additional evidence that instructional practices are more

closely intertwined with student culture than teacher culture. Without changing the approach to instruction it is unclear how much schools can really change student experiences.

Although there was a strong correlation between the 14-item inquiry index and PBL use ($r = .50$, $p < .001$), it is surprising that several of the inquiry related practices—portfolio and open-ended assessments, student use of data, and students evaluating competing views—were reported with similar frequency in unaffiliated small schools as in reform model schools. Many teachers outside the reform models also indicated that students were solving real-world problems, deciding how to present what they had learned, and orally presenting their work (each was reported by two thirds of teachers, regardless of school type). In the future it will be important to understand how these inquiry-related practices differ when embedded in a PBL context or not. It seems clear that some potentially valuable inquiry-related practices do not require PBL. On the other hand, use of PBL without associated inquiry practices does not sound like the kind of PBL that was originally defined and it may be important to clarify what constitutes effective practice in these schools.

Future research might offer guidance as small high schools try to go beyond changing culture to changing instruction. The kind of holistic (instructional, cultural, and systemic) vision that is seen in the reform models in this study may still be available and attainable to varying extents in the rest of the small schools. It would be interesting to seeing what could happen if policies and statewide initiatives become more intentionally designed to influence instruction. This study's findings suggest that the kinds of shifts desired for teachers and students—both instructional and cultural—will be easier to make when there is a top-level vision for instructional changes in addition to the kinds of cultural reforms that have been discussed.

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