

Putting PBL to the Test: The Impact of Project-based Learning on Second-Graders' Social  
Studies and Literacy Learning and Motivation in Low-SES School Settings

Nell K. Duke

University of Michigan

Anne-Lise Halvorsen

Michigan State University

Stephanie L. Strachan

Western Washington University

Jihyun Kim

Lehigh University

Spyros Konstantopoulos

Michigan State University

Acknowledgements: This work was supported by grants from the Spencer Foundation and the George Lucas Educational Foundation. The authors thank the following research assistants for their work on this project: Jason Burns, Scott Farver, Ryan Hughes, Cathy Johnson, Julie Malloure, Hugh Potter, David Reid, Annie Reinish, Katie Revelle, Will Toledo, and Crystal Wise.

### Abstract

This cluster randomized controlled trial investigated the impact of project-based learning with professional development supports on social studies and literacy achievement and motivation of second-grade students from low-SES school districts. At random in within-school pairs, 48 teachers were assigned to the experimental or comparison group. Experimental group teachers were asked to teach four PBL units designed to address nearly all social studies and some literacy standards. Comparison group teachers were asked to teach social studies as they normally would except to teach a target number of lessons. The experimental group showed higher growth in social studies and informational reading, but not writing or motivation. Greater consistency with PBL session plans was associated with higher growth in writing, motivation, and reading.

*Keywords:* project-based learning, social studies, informational reading and writing, low-SES, high-poverty school districts

## Putting PBL to the Test: The Impact of Project-based Learning on Second-Graders' Social Studies and Literacy Learning and Motivation in Low-SES School Settings

The ideas driving project-based learning (PBL) have a long history in American education dating back to the early twentieth century during the Progressive Era (Kliebard, 2004). Progressive educator John Dewey helped popularize, at least in theory, approaches to education that were student-centered, had practical meaning and application, and, in his view, promoted democracy by providing students with more educational opportunities and by teaching citizenship (Dewey, 1902)—all characteristics associated with PBL. Another progressive educator, sociologist David Snedden, advocated the use of practical projects to engage students in learning by doing in the field of vocational education (Snedden, 1916). William Kilpatrick (1918) encouraged the use of projects, such as designing a kite or presenting a play, in which students developed knowledge and skills and engaged in activities that, he argued, prepared them for life. Progressive educators disagreed on essential aspects of a project-based approach, but they all viewed projects as a compelling alternative to traditional instructional approaches they considered to be dry, fact-based, disconnected from students' lives, and teacher-centered.

Throughout the twentieth and into the twenty-first century, PBL has been a presence in the educational literature. Much of the existing research on PBL shows promise for the approach, yet there has been relatively little research testing its impact, particularly at the elementary level. Reviews of research on PBL reveal that the majority of studies have taken place in middle- and high-school classrooms and have not been designed in such a way as to draw clear causal conclusions about the impact of PBL—although they have certainly made other important contributions to our understanding of the approach (Condliffe, 2016; Holm, 2011; Kokotsaki, Menzies, & Wiggins, 2016; Thomas, 2000).

There is a particular need to study the effects of PBL on social studies and informational reading and writing achievement and for underserved student populations, including students living in poverty. In the U.S., social studies and informational reading and writing are neglected in the primary-grade school settings, particularly in low-socio-economic status (SES) classrooms (Duke, 2000a; Fitchett & Heafner, 2010; Jeong, Gaffney, & Choi, 2010; McGuire, 2007; Pace, 2012; VanFossen, 2005; Vogler, et. al, 2007). Although there is no research on the degree to which children in low- versus high-SES settings experience PBL, as detailed later, research has found that some key practices related to PBL are less likely to occur in low-SES school settings.

Given the longevity of PBL, the lack of efficacy studies with young learners, and the need to investigate strategies for addressing inequity in certain educational opportunities, we set out to study the impact of PBL for second graders in low-SES schools in the U.S. by conducting a cluster randomized controlled trial comparing the social studies and literacy (in particular, informational reading and writing) achievement and motivation of students engaged in PBL to that of students whose teachers taught social studies and literacy as they normally would except with a promise to teach a target number of social studies lessons.

## **Theoretical Framework**

### **Conceptualizing PBL**

Educational researchers have expressed differing opinions about what PBL consists of or how it should be implemented (e.g., Barron et al., 1998; Krajcik et al., 1998; Thomas, 2000). The Buck Institute, a non-profit organization that disseminates products and professional development in PBL, identified as essential design elements of “Gold Standard PBL” (what PBL looks like when it is done effectively) as: “(1) a challenging problem or question; (2) sustained inquiry; (3) authenticity; (4) student voice and choice; (5) reflection; (6) critique and revision;

and (7) a public product” (Larmer, Mergendoller, & Boss, 2015, p. 37). In social studies education specifically, Parker and colleagues (2011, 2013) developed PBL curricula for the Advanced Placement U.S. Government and Politics course according to five key principles: “rigorous projects as the spine of the course, quasi-repetitive project cycles (looping), engagement first, teachers as co-designers, and an eye for scalability” (Parker et al., 2011, p. 538). The projects included in their PBL curriculum also followed an inquiry-based learning approach; a “master question” unified all the projects and as students progressed through the projects, they revisited and attempted to answer the master question (Parker et al., 2013).

Some use the term “project-based learning” interchangeably with “problem-based learning” (McDowell, 2017). In a review of research on problem-based learning, Gijbels, Dochy, Van den Bossche, and Segers (2005) invoke Barrows (1996) in identifying six core characteristics of problem-based learning:

1. Learning is student-centered.
2. Learning occurs in small student groups.
3. A tutor is present as a facilitator or guide.
4. Authentic problems are presented at the beginning of the learning sequence, before any preparation or study has occurred.
5. The problems encountered are used as tools to achieve the required knowledge and the problem-solving skills necessary to eventually solve the problems.
6. New information is acquired through self-directed learning. (pp. 29 – 30)

A Venn diagram could characterize the relationship between these six characteristics and those identified earlier as defining “Gold Standard PBL.” Some units could meet both sets of criteria. Others could be problem-based but not project-based—if they lack sustained inquiry and a public product. Others could be project-based but not problem-based, if, for example, the project centers around an opportunity (e.g., an upcoming event in the community) rather than a problem

and involves building some background knowledge prior to the project's onset. The projects examined in our study are best characterized as project-based rather than problem-based because not all of them focus on a problem and all involve sustained inquiry and a public project.

Our conceptualization of project-based learning overlaps considerably with those previously described. In our view, three defining characteristics of PBL are that: (1) Students work toward something (i.e., a project) for an extended period of time. (2) What students are working toward is the primary driver of learning during a unit as well as the culmination of that unit. Throughout the unit, each activity in which students engage is not carried out for its own sake, or because the teacher told them to, but rather to contribute to meeting the project's goals either directly or by developing knowledge and skills needed to carry out the project. (3) The projects students work on have a purpose beyond satisfying school requirements or expectations: addressing a real problem, need, or opportunity in the world.

### **Curricular Opportunities for Students in Low-SES School Settings**

PBL can be seen as an approach to curriculum. As such, it positions teachers and learners in specific ways and conveys particular cultural values (e.g., valuing inquiry and local contexts, constraining transmission and passivity) (Au, 2012; Eisner, 1985). There is no research to indicate whether this approach is more, less, or equally common in low- as compared to high-SES settings. However, there are practices associated with PBL that have been shown to be less common in primary-grade classrooms in low-SES school settings. In over 10,000 minutes of observation in second-grade classrooms, Billman (2008) found 0 minutes devoted to inquiry in social studies in low-SES classrooms but 82 minutes of inquiry activities observed in high-SES classrooms. Strachan (2018) found that students in primary-grade classrooms in low-SES settings were less likely than those in high-SES settings during social studies to engage in

student-led activities, to read or write extended text, or to write for an audience other than the teacher. In contrast, they were more likely to spend time with textbooks. Similar findings have been observed in literacy education. For example, Duke (2000b) found that children in low-SES school districts were less likely than children in high-SES districts to have opportunities to engage in literacy in the content areas, to make choices in their reading, to exert a high degree of authorship in their writing, or to read or write for audiences beyond the teacher alone. Setting domain aside, research has also long indicated that teachers have, on average, lower expectations for children of lower SES in a variety of respects (Dusek & Joseph, 1983). As documented in Anyon's (1981) classic work, through curriculum, schools become agents of social reproduction.

In contrast, the project-based units involved in our study are grounded in a theoretical framework that positions young students as having the potential to be powerful change agents in their community, able to learn skills and content necessary to influence the world around them. We draw on scholarship that argues that young students can notice a need or injustice, affect policy, and “do good.” As Chi, Jastrzab, and Melchior (2006) argue: “In many ways, the elementary level is an ideal time to create a strong and meaningful foundation for the civic knowledge, skills, and dispositions needed to prepare and engage students as active citizens ...” (p. 24). Previous scholarship has demonstrated that students, including students of low-SES, are equipped to do this work. For example, in a justice-oriented economics unit, Sylvester (1994) found that a third-grade class could grapple with authentic social and economic issues: homelessness, entrepreneurship, economic competition, and unemployment. Mitra and Serriere (2012) found that fifth graders in a socioeconomically diverse school who learned the ABCDEs of youth development—agency, belonging, competence, discourse, and (civic) efficacy—could engage successfully in school life and civic life by identifying and addressing a local issue.

A second framework that guides our project-based units argues that instruction should be ambitious—defined broadly as disciplinary learning that infuses equity and responsiveness and uses specialized practices and tools (see, for example, Lampert & Graziani, 2009; Thompson, Windschitl, & Braaten, 2013)—and rigorous—defined by McDowell (2017) as having clarity in their expectations, challenging students, and involving students in a culture devoted to making a difference. Stroupe, DeBarger, and Warner (2016) argue that PBL is highly compatible with ambitious instruction, with a high degree of overlap between PBL and Ambitious Instruction in that both involve: creating purposeful and authentic project experiences; learning experiences that are driven by deep integration of core disciplinary content and practices; interactions among students that are encouraged to be supportive; and teaching and assessment practices that are research-based (pp. 12-15). PBL is also compatible with the related construct of rigorous instruction. Our projects are rigorous, not only in the traditional sense that they are aligned with state and national standards that are often characterized as rigorous, but also as defined by McDowell (2017), particularly, in our case, by connecting students to their communities.

### **Review of Literature**

As noted earlier, a number of studies have examined the effects of project-based learning in middle, high school, and post-secondary contexts (e.g., Boaler, 1997; Geier et al., 2008; Harris et al., 2014; Parker et al., 2011, 2013). Studies at these levels suggest that PBL can be effective at fostering student learning and engagement. Fewer such studies have been conducted with younger students, particularly those in the pre-primary and primary grades.

Some studies of PBL with young children have focused on effects on overall development, rather than a particular content area or domain. In one study, Habok (2015) compared pre- and post-test performance on assessments of experiential reasoning and logical



relations of kindergarten children in two classrooms (SES unspecified) in Hungary. One classroom used what the author referred to as *the project method* with concept mapping for three units (on mushrooms, Christmas, and Carnival) between pre-testing in October and post-testing in May. The amount of time devoted to the method was not specified. The other classroom employed traditional instruction. At pre-test, children in the traditional-instruction classroom had an advantage over those in the project-method classroom. At post-test, children in the project-method classroom attained the same level as children in the traditional-instruction classroom.

Other studies have focused on PBL in relation to specific domains. Aral, Kandir, Ayhan, and Yasar (2010) examined Turkish children's acquisition of basic concepts (e.g., colors, shapes) in one classroom that used the typical preschool curriculum and another classroom in the same school in which teachers taught the concepts using PBL (SES unspecified). PBL was employed once per week for 12 weeks. Few other details were provided. In contrast to the other studies reviewed, in this study there was no evidence of an advantage for a project-based approach.

Focusing on science content knowledge, Robinson, Dailey, Hughes, and Cotabish (2014) randomly assigned teachers in 70 classrooms in low-income schools in the U.S., grades two through five, to an experimental group who experienced a PBL curriculum along with more than 100 hours of professional development over two years (including a summer institute and weekly coaching) or to a comparison group who taught science as usual for the year. Although results for the full sample have not been published, Robinson et al. (2014) compared the learning gains of students labeled as gifted in both groups, concluding that those students who participated in the PBL condition made statistically significantly greater learning gains in science process, concepts, and content knowledge than the comparison group. The randomized design allowed a strong causal inference regarding the relative efficacy of the experimental and control conditions;

however, within the experimental condition it is difficult to parse out the effects of PBL as compared to the large number of hours focused on professional development that sometimes dealt with science content, technology, and differentiation as opposed to only PBL.

Also focused on science learning was a study by Dresden and Lee (2007) involving first-grade students in a low-SES school in the U.S. Science learning was examined in one classroom before and after participating in a teacher-directed unit on different types of animals and then again after participating in a PBL unit on chicks. Assessments asked students to discuss an animal of their choice—or specifically a chick following the PBL unit—and to provide facts about that animal, as well as draw and label a picture of the animal. The researchers found that students used statistically significantly more words to describe their animal following the PBL unit and had higher levels of detail and accuracy in their writing at that point. However, the improvements might have stemmed from the fact that the PBL unit on chicks followed a unit on different types of animals in which important conceptual groundwork may have been laid. Chicks is also a narrower topic than animals, which may have contributed to the findings.

Motivation, as well as science content learning, was the focus of the Kaldi, Filippatou, and Govaris (2011) study, involving children in ethnically diverse classrooms (SES unspecified) in Greece just above the primary grades (year 4; ages 9 and 10). Using a single group pre-test post-test design, the researchers examined students' knowledge of sea animals as well as motivation and attitude towards environmental studies following participation in a PBL intervention lasting between two and three months in six classrooms. Interviews with teachers and students showed statistically significant pre- and post-test differences for science content learning as well as motivation in this learning domain. They concluded that the students in the

study “found [PBL] amusing and more motivational in comparison to traditional teaching methods (direct instruction, teacher talk, studying from their own textbooks)” (p. 43).

Also focused on science motivation as well as learning was the Karaçalli and Korur (2014) study. In this study, which the researchers identified as quasi-experimental, 143 fourth-grade students in Turkey (SES unspecified) experienced four weeks of one-hour daily experience learning about electricity in daily life. The experimental and comparison groups experienced the same presentation materials and explanations. The experimental group applied their learning in the form of an ongoing project, whereas the control group answered questions about material and prepared questions to ask of their friends. Students in the PBL group had better achievement and retention of the material taught, but, unlike in the Kaldi, Filippatou, and Govaris (2011) study, did not display effects on motivation (a measure of attitudes toward science and technology).

We were able to locate only two studies examining the effects of PBL in relation to social studies learning in the primary grades, although there are certainly suggestive studies with older students in the U.S. (e.g., MacArthur, Ferretti, & Okolo, 2002; Parker et al., 2011, 2013) and in problem-based learning (e.g., Brush & Saye, 2014). In one study, 7 children ages 6 to 7 from a special education class in Turkey (SES unspecified) participated in a project-based unit for one to two weeks (Güven & Doman, 2007). Children improved in their understanding of bakeries (which could be considered social studies content) following the unit and field trip. In a second study, second-grade students in low-SES schools in the U.S. made statistically significant gains in social studies knowledge and informational reading and writing following engagement in two project-based units, one focused on economics and the other on geography (Halvorsen et al., 2012). In addition, students’ post-scores were statistically the same as post-scores of students in high-SES schools who had not experienced our units, suggesting that PBL may help to narrow

the achievement gap. However, as in nearly all of the studies discussed in this review, this study did not use a randomized controlled trial design that would afford a strong causal inference.

Some additional studies of PBL in the pre-primary or primary grades examine teacher, student, and/or parent perceptions of the approach (e.g., Beneke & Ostrosky, 2009; Chu, Tse, & Chow, 2011; Tretten & Zachariou, 1995) or teacher implementation. For example, Chu et al. (2011) examined teachers', parents', and students' perceptions of the impact of PBL in science and social studies over 19 weeks on students' information technology or informational literacy (e.g., internet searching) skills on four classes of P4 (9- to 10-year olds, just outside of the primary-grade age range) students in Hong Kong. All groups thought that students' skills were improved, and students expressed that the skills were important to their work.

In sum, the relatively small number of studies that have examined effects of PBL in the primary grades have, with one exception, found evidence of promise of the approach for general development and content learning and mixed evidence of promise with respect to motivation. However, only one of the studies, focused on science, has employed a randomized controlled trial (RCT) design, which is best suited to drawing causal conclusions. Four reviews of research on PBL (Condliffe, 2016; Holm, 2011; Kokotsaki, et al., 2016; Thomas, 2000) have also noted the dearth of studies with an RCT design. Such studies are needed, particularly in social studies, which has received little attention in the primary-grade PBL research literature.

### **Research Questions**

The present study addressed gaps in the research literature by examining the impact of project-based learning on social studies and literacy achievement and motivation in the primary grades in low-SES school settings using a cluster randomized controlled trial design. The study was carried out with a sample of teachers during their first and only year of implementation who

had, except for one, never carried out PBL—perhaps the most challenging context in which PBL has ever been tested. The research questions were: (1) What is the impact of being in classrooms of teachers randomly assigned to implement, with some PD support, an integrated, project-based approach, as compared to business-as-usual (but with a promise to teach a target number of lessons) instruction, on the (a) social studies learning, (b) informational reading, (c) informational writing, and (d) motivation of second-grade students in low-SES school settings? (2) Among teachers randomly assigned to implement integrated, project-based units, is greater consistency with unit session plans associated with greater student learning and motivation?

## **Method**

### **Study Design**

This study was a cluster randomized experiment in which 48 teachers were assigned randomly to an experimental ( $n = 24$ ) or a comparison ( $n = 24$ ) group within second grade in each school. Teachers in the experimental group were provided with one initial professional learning workshop, three follow-up recorded webinars, coaching, and detailed session plans for 80 sessions within four project-based units, one each for economics, geography, history, and civics and government. Comparison teachers were asked to teach their regular social studies curriculum (which in no case involved PBL). They were asked, and agreed, to teach 80 lessons over the course of the year so that the amount of social studies instruction could be held constant across conditions. Teachers in both groups were systematically observed. To measure student growth, near the beginning and end of the school year, we administered pre- and post- standards-aligned measures of social studies, informational reading, and informational writing, and a Likert-scale motivation survey about social studies, literacy, and integrated instruction.

### **Participants**

Participants were second-grade teachers ( $N = 48$ ) and their students ( $N = 684$ ; comparison group = 289, experimental group = 395) from 20 elementary schools (16 schools with two participating second-grade classrooms and 4 schools with 4 participating second-grade classrooms) in 11 school districts. Classrooms were drawn from schools in a Midwestern state that met the following criteria: (1) at least 65% of the student population qualified for free or reduced-priced lunch; (2) below state average student performance on state exams in social studies (assessed at grade six in this state), reading (assessed in grade three), and writing (assessed in grade four); and (3) location within an hour's drive of either of the university sites where the principal investigators were located. The free or reduced-priced lunch rates of participating schools ranged from 65% to 100%, with a mean of 80.350%.

All second-grade teachers within qualifying schools were invited to participate; at least two teachers in each school needed to agree to participate in order to be included in the study. Teachers were paired within second grade in each school; one member of each pair was randomly assigned to implement four units of our integrated, PBL approach to teaching social studies and informational reading and writing (the experimental group [E]) whereas the other was asked to teach social studies using the approach they normally would during any other school year (the control group [C]). As detailed later in this section, for 15 of the 24 comparison group teachers, this involved using a (non-project-based) curriculum developed by two state education organizations, and for 9 of the 24 comparison group teachers, this involved using a national social studies textbook series. The remaining 2 comparison group teachers used self-designed (non-project-based) lessons. Comparison group teachers were asked to promise to teach at least 80 social studies lessons over the course of the year, considerably more than they likely

would normally have taught. In that sense, they too were participating in an intervention—to increase the amount of social studies instruction provided in schools.

Table 1 provides information for evaluating initial E versus C group comparability. There were no statistically significant differences between E teachers and C teachers in years of teaching experience nor having received PD in PBL. Even among those reporting having received prior PD in PBL, there was no indication from observations and questionnaires that comparison group teachers actually used a PBL approach to teach social studies, nor, from interviews, that any but one experimental group teacher did so prior to the study year.

All students within participating classrooms were invited to participate through a parent/guardian consent form. The two whole-class-administered assessments were collected from all students whose parents provided consent. The two individually-administered assessments were given to only a randomly selected subset of students due to budgetary and thus personnel constraints. Despite this, sample sizes at post-test for each assessment were adequate: social studies: E = 305, C = 257; reading: E = 307, C = 252; writing: E = 358, C = 270; motivation: E = 343, C = 265. A total of 47.937% percent of students had a mother or guardian with higher than a high school education. Among these students, 17.12% of students had a mother or guardian with an associate's degree Participating students were majority minority, with 57.048% non-White. Additional demographic information about students and participating teachers, as well as students' baseline/pre-assessment scores can be found in Table 1. As this is a cluster randomized experiment, with teachers randomly assigned to condition, data reported in Table 1 are all aggregated and t-tests conducted at the teacher level (the unit of random assignment). Measures are after attrition took place. As the independent samples t-tests show in the last column of Table 1, the experimental and comparison groups were comparable on average

in terms of demographic variables and pre-assessments. Variances on pre-assessments in the two groups were also statistically equivalent for all measures as determined by F-tests. Thus, we can assume that the randomization of our study was realized as intended.

It is noteworthy that there was no attrition at the teacher level. In terms of student attrition rate, the overall attrition rate was 7.895%. The differential attrition rate for the experimental group was 9.367%, and 5.882% for comparison group, which indicates that their difference was less than four percentage points. Although the attrition rate for experimental group was higher than that of comparison group, the descriptive analysis and baseline equivalence of covariates from before attrition were very similar to those reported in Table 1. That is, overall the sample of participating students was similar to the sample of students initially assigned to E or C conditions. Combined with the low overall and differential attrition, we find no evidence that attrition had any influence on our estimation of the treatment effect.

### **Experimental Group Condition**

The four project-based units used in this study were designed to involve children in PBL as defined earlier in this paper. We used a design-based research approach to develop the units, field testing and obtaining feedback from teachers (not involved in the present study) throughout the process (see Halvorsen et al., 2012, 2018 for a description of the methodology). The four PBL units, taught in the following order, were (1) Producers and Producing in Our Community (economics); (2) Brochure about the Local Community (geography); (3) Postcards about the Community's Past (history); and (4) The Park/Public Space Proposal Project (civics and government).

Although the unit and session plans were pre-made and the same for all classrooms, they were written to embed opportunities for connections to whatever local community in which the



unit was taught and for teacher and student voice and choice. We also ensured that there were opportunities for informational text reading and writing within each unit. The project for the economics unit involved creating an informational flier about a local business for that business' use and creating and selling their own good or service to raise money for a cause. The business chosen, the good or service created and sold, and the cause were all decided by each class. The geography project involved developing a brochure to persuade people visiting or considering settling in the local community that it has compelling natural and human characteristics. The local community varied by district, and the natural and human characteristics were chosen by each child—for example, one child might choose to feature the local athletic center, whereas another might choose to feature the local public library. In the history unit, the project involved students developing postcards about the history of the local community to display or sell in a local institution, such as a library or historical society (again with the community varying by district), with the teacher and/or students deciding which historical sites to feature, whether to sell or display their postcards, and the location(s) where postcards are shared. The civics and government project involved developing a proposal, conveyed in letters and in a group presentation, to persuade the local city government to make improvements to a local park or other public space selected by the teacher and/or teacher and students collectively. See Appendix A for abstracts of each project.

In addition to characteristics of PBL described earlier in the paper, projects had some characteristics that are seemingly less common for PBL: they included explicit instruction, involved domain-specific research-supported instructional practices, and were closely aligned to standards. Specifically, units addressed nearly all social studies standards for the state, which were largely aligned with the College, Career, and Civic Life (C3) Framework for State Social

Studies (National Council for the Social Studies [NCSS], 2013) and a subset of standards from the Common Core State Standards for English Language Arts and Literacy in History/Social Studies, Science, and Technical Subjects (CCSS; National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010), particularly those involving informational reading and writing. However, it was understood that, unlike the social studies standards, the literacy standards should also be addressed in other parts of the day/outside our units, including in reading, writing, and science instruction.

Each of the four units was comprised of 20 sessions designed to take approximately 45 minutes of instructional time each. (We use the term “sessions” rather than “lessons” because only a portion of each session is what might traditionally be considered a “lesson,” much of the session time involved small group and individual work on the projects.) We designed session plans to clearly indicate learning objective(s) and standards addressed, any materials required, key vocabulary terms and definitions critical to the sessions, instructional steps of the session, and additional notes for the teacher (e.g., potential pitfalls to avoid). With few exceptions, each session followed a similar format: (1) whole group instruction and discussion to generate and sustain student interest and excitement about the project as well as to provide explicit instruction (approximately 10 minutes); (2) guided small group or individual instruction in which students have opportunities to work individually, in pairs, or in small groups (~ 20-30 minutes); and (3) whole class review and reflection, which included clarifying any confusions and reviewing key terms (~ 10 minutes). For example, a session might involve the teacher reading aloud a text related to the unit project, with instruction in social studies content as well as literacy skills, such as how to use an index. In small groups, students might then use information learned from the text and other materials to complete portions of a graphic organizer that would guide their

writing of the unit's final product. Then students might then come back together to share their graphic organizers and review with the teacher key content from the beginning of the session. In addition to unit plans, teachers were provided with any texts, artifacts, or other materials, beyond typical school supplies, that were needed to carry out each unit.

Although we recognize that PBL is initially challenging to implement (e.g., Marx et al., 2004), we were cognizant of the limited amount of support many districts or schools are likely to provide when introducing a new curriculum when a research team and grants are not involved. In an attempt to maintain a high level of ecological validity, we were relatively austere about the amount of outside-the-classroom PD provided with the PBL units: (1) three hours of initial professional development that introduced participants to PBL, to our research initiative, and to the first project-based unit; (2) three recorded webinars ranging between 22 and 40 minutes introducing the next three units; and (3) added for a subset of the classrooms, a brief five-minute video of several experimental teachers discussing strategies for addressing some common challenges with units. In contrast, inside-the-classroom we did provide substantial support in the form of, on average, eleven visits from research assistants (RAs) who provided coaching for unit implementation after the session they observed, with additional communications, as necessary, by phone and/or e-mail. We believed that coaching support had a high degree of ecological validity given the prevalence of instructional coaches in high-poverty school districts. Coaches interacted with teachers only after sessions (during sessions they were taking observation notes, as explained later in this section) and were instructed to restrict their interaction with teachers to implementation of what was in the unit or session plans, rather than larger issues of instruction or classroom management that may impact PBL implementation. Finally, the project unit and session plans that we developed had a high degree of detail regarding the structure and content of

the lessons and included educative curriculum features, such as child-friendly definitions of key terms. Scholarship has demonstrated that curriculum materials have the potential to serve as a form of professional development in their own right (Davis & Krajcik, 2005; Drake, et al., 2014).

Teachers signed a letter of consent in which they committed to teaching 80 lessons over the course of the year, but the mean number of lessons/sessions taught by experimental group teachers was 65.917, with a standard deviation of 9.184 and a range of 48 to 86. In general, teachers who did not teach a full 80 lessons/sessions did not teach the civics and government unit ( $n = 6$ ), taught an abbreviated version of that unit ( $n = 13$ ), or taught an abbreviated version of the history unit ( $n = 13$ ), but did teach up to four review sessions we provided.

### **Comparison Group Condition**

As indicated previously, teachers in the comparison group were asked to teach social studies as they normally would during any other school year except to increase their instruction to a goal of teaching 80 social studies lessons over the course of the year. Of the 24 total teachers in the comparison group, 15 teachers taught social studies using a curriculum developed through two state education organizations by educators from school districts and subject area consultants and aligned to the state social studies standards. Typical units in this curriculum were comprised of several open-ended questions to guide inquiry during the course of study, key vocabulary concepts, and a series of 1-9 lesson plans. Common activities included read-alouds of children's literature, writing anchor charts, class discussion, small group activities, analyzing maps or timelines, video clips, vocabulary work, worksheets, and assessments. None of the units was project-based. Two teachers using these units supplemented them with magazines (*Social Studies Weekly*; *Scholastic News*); two teachers added an extended teacher-created unit at one point in

the year; and two other teachers improvised all text-based lessons because they were not provided the texts called for in the unit plans.

Seven of the remaining nine teachers not using the curriculum described in the previous paragraph utilized district-created lessons or social studies textbooks as the primary mode of instruction, including TCI (*Social Studies Alive!*), MacMillan/McGraw Hill, and Scott Foresman. The social studies textbooks were not specifically aligned with this state's standards, but there appeared to be considerable overlap with state expectations. Lessons consisted of discussing content vocabulary, reading the textbook, watching videos, completing worksheets or written assignments, whole-class discussion, and small group work. The remaining two comparison teachers taught self-designed lessons as their schools did not provide any social studies curriculum or materials. Much like the lessons designed by the two state organizations, teacher-created lessons typically consisted of vocabulary instruction, whole-class discussion, read-alouds, independent reading, graphic organizers, visual aids, group work, and written activities. Neither the textbook-based instruction nor the teacher-designed instruction was project-based.

Teachers signed a letter of consent in which they committed to teaching 80 social studies lessons over the course of the year, but the mean number of lessons taught by comparison group teachers was 51.375, with a standard deviation of 17.118 and a range of 30 to 85. This is statistically significantly fewer lessons than taught by the experimental group teachers (mean = 65.917 lessons,  $t = -15.217$ ,  $p < .001$ ). However, as explained in the Discussion section, dosage analyses indicate that the 15-lesson difference in mean number of lessons taught is not sufficient to explain the advantage of the experimental group over the comparison group in study results.

### **Data Sources**

Our four outcome measures were: (1) a standards-aligned social studies assessment administered one-on-one; (2) a standards-aligned informational reading assessment administered one-on-one; (3) a writing assessment comprised of a group-administered paper and pencil persuasive writing assessment and informative/explanatory writing assessment; and (4) a group-administered paper and pencil motivation assessment. All measures were developed by our team due to the lack of social studies or informational reading and writing assessments aligned with state standards and the lack of a motivation measure that addressed social studies, informational reading and writing, or integrated instruction. Sample items from each assessment are provided in the paragraphs that follow (space limitations preclude appending the instruments, but they are available upon request from the first author). Validity and reliability of each assessment are reported in the paragraphs that follow. Students were assessed near the beginning and end of the school year. Items from all assessments were piloted and refined before administration.

**Social studies assessment.** The social studies assessment was aligned with state content expectations and the C3 Framework (NCSS, 2013). Eleven items with multiple subparts measured student achievement in economics; geography; history; civics and government; and public discourse, decision making, and citizen involvement. Some questions were open-ended, such as: “What services does the local government provide?” and “Why do we use timelines?” Others were close-ended, such as showing a map with a key and asking “Tell me which direction you would go to get from the child’s house to the park?” and a question that required children to sort pictures of items involved in the production of pizza into the categories of natural, human, and capital resources. Each item corresponded to all or part of a state standard for social studies for second grade. Without knowledge of whether a given assessment came from a child in the experimental or comparison classrooms (i.e., blind to condition), we scored the responses of the

11 questions on scale of 0 to 3, with a score of 3 indicating fully meeting the standard, for a total possible score of 30 (two questions measured the same standard and were thus averaged for one score for the standard, for a total of 10 items). Students' raw scores were transformed to a percentage format; the raw scores were divided by total possible scores of each assessment.

To examine assessment validity, five reviewers with expertise in social studies were asked to identify the question(s) that best aligned with each content expectation; they had 96% agreement with our determination of the alignment of standards and assessment questions. With regard to reliability, project members established a high inter-rater reliability at Fleiss' Kappa = 0.883 for scoring the assessment, and the 10 social studies items had an acceptable internal consistency ( $\alpha = 0.715$ ).

**Informational reading assessment.** This assessment was comprised of a total of 31 items that measured student achievement of six of the ten second-grade CCSS for Reading Informational Text (standards 4 through 9). Sample questions included: "What are reasons the author gives to support her point?" (CCSS for Reading Informational Text # 8) and "What is the writing under a picture called?" (CCSS for Reading Informational Text #5). The research team scored questions blind to condition on a scale of 0 to 3 with a score of 3 meaning fully meeting that CCSS expectation. This provided a total possible score of 87 (not 93 because one trio of questions all dealt with one text feature and therefore were scored together on the 0 to 3 scale).

To examine validity, five experts in the field of early literacy reviewed the assessment and were asked to identify which CCSS in Reading Informational Texts corresponded with each assessment item. There was 95.5% agreement between these experts' reviews and our own identification of which CCSS best addressed each assessment item. With regard to reliability,

research team members established a high inter-rater reliability of Fleiss' Kappa = 0.874 when scoring this assessment, and items had high internal consistency ( $\alpha = 0.863$ ).

**Informational writing assessment.** This assessment measured student achievement of writing for two distinct purposes detailed in the CCSS: to opine or persuade (writing standard 1) and to inform or explain (writing standard 2).

*Persuasive writing.* This prompt asked students to write independently for 30 minutes about “something you think people should change and why.” Students were given a purpose and audience for the writing: “My friends and I will read what you write to get ideas about things we should try to change” and were provided with a list of potential areas of change. Responses were scored blind to condition using a rubric aligned to expectations in CCSS writing standard 1 for second grade as follows: introduction (on a scale of 0 to 2), opinion (0 to 2), reasons (0 to 3), linking words (0 to 1), concluding statement (0 to 2), for a total possible score of 10.

*Informative/explanatory writing.* This prompt asked students to write an article for up to 30 minutes about a community job (e.g., firefighter) for a class magazine. This topic was chosen because it was not addressed in the project-based units so would not inappropriately advantage students in the experimental group and because students would likely to be able to draw on considerable background knowledge/information in responding (thus it would serve as a test of informational writing skill, not knowledge/information). Students were provided with a list of potential jobs. Their responses were scored blind to condition using a rubric aligned to expectations in CCSS writing standard 2 for second grade: introduction (0 to 2), information (0 to 3), definition (0 to 1), concluding statement (0 to 2), for a total possible score of 8.

An overall informational writing achievement score was created by combining scores for responses to the persuasive and informative/explanatory prompts for a total score of 18. With



regard to validity, an inter-rater reliability of Fleiss' Kappa = 0.734, which is considered high, was established by project members for scoring of this assessment. Internal consistency reliability was borderline (not surprising in prompted writing assessment) at 0.661.

**Motivation assessment.** The motivation assessment was modeled after validated motivation assessments (e.g., McKenna & Kear, 1990) and measured student motivation to engage in and participate in (a) social studies learning, (b) literacy learning, and (c) integrated social studies and literacy learning (there were also items on PBL, but those were not included in analyses given that students in the comparison group did not participate in PBL). Children were read 24 statements such as, "When I use maps to learn new things, I feel..." and "When our class learns about social studies and reading at the same time, I feel..." After each statement, they were asked to circle one of four images of a character, depicting an emotional state ranging from "very happy" to "very upset." Responses were scored on a scale of 1 (very happy) to 4 (very upset) for a total score of 96. Cronbach's alpha reliability for the assessment was 0.884.

**Observations.** In order to most meaningfully address the first research question, we needed to ascertain whether the experimental group classrooms were indeed implementing PBL and whether the comparison group classrooms were indeed not doing so. To address the second research question, we needed to know the degree to which experimental group classrooms were implementing PBL as intended. In order to gather this and other information, we developed an observation protocol. For the purposes of this paper, the critical components of the observation protocol were: for research question 1, an item for observations in experimental and comparison classrooms requiring rating the "Degree to which the lesson appears to be set in project-based context" on a scale of 1 to 3 (from *does not appear to be set in project-based context* to *appears to be set in project-based context*) and for research question 2, three items for observations in

experimental classrooms only requiring “Ratings for consistency with session plans,” one each for whole group instruction and discussion, guided small group or individual instruction, and whole group review and reflection. Each item was rated on a scale of 1 to 3, with 1 = follows fewer than 50% of the steps in the session plan for that section of the session, 2 = follows 50% - 80% of the steps, and 3 = follows 80% or more of the steps for that section of the session. The ratings were not based on the degree to which teachers adhered to specific suggested wordings in the plans or the like, but rather the degree to which they enacted important components of the unit session plans as designed, such as providing information about or communication from the target audience, allocating time for children to carry out research, and reviewing key points from an earlier session. The observation protocol was used by RAs, who observed full sessions (their coaching conversations with teachers occurred after the sessions; teachers perceived them as having the dual roles of observing instruction and providing [only] project-related coaching support as needed). They carried out an average of 11.208 and 5.458 visits to experimental and comparison classrooms respectively. Variables stemming from the teacher observations achieved a mean interrater reliability of .658 in Fleiss’ Kappa, which indicates substantial agreement.

**Other data.** Other data collected include students’ demographic/background information (minoritized status, gender, and mothers’ education level), teacher background characteristics (years of teaching experience and whether they received professional development in PBL), and interviews with experimental group teachers (with the interviews not included in this paper except with respect to teachers’ responses regarding their experience with PBL prior to the data collection year and number of sessions taught).

### **Data Analysis**

**Descriptive statistics.** We used descriptive statistics to examine student achievement and motivation in the experimental and comparison groups and inferential statistics (t-tests) to determine any significant differences in raw scores on pre-assessments of student achievement and motivation between students in the experimental and comparison groups. We also generated descriptive statistics regarding consistency with unit session plans in the experimental group.

**Hierarchical linear modeling.** To take into account the nested relationships in the study (i.e., students nested within teachers), we used hierarchical linear models (HLM) (Bryk & Raudenbush, 1992). Using a two-level hierarchical linear model (level 1: student and level 2: teacher), we explored the effects of the intervention (controlling for female status, minoritized status, mothers' education, and pre-assessment) on social studies achievement, informational reading, informational writing, and motivation and, for the experimental teachers, the relationship between consistency with unit session plans and social studies achievement, informational reading, informational writing, and motivation. The two-level model matches the research design and is appropriate for the data. This analytic strategy and the detailed data we collected about instruction in the experimental classrooms meant that analyses could examine not only the impact of the project-based units by condition but also whether children showed greater gains in social studies achievement in classrooms in which the teacher implemented project sessions with a higher degree of consistency with unit session plans.

First, we examined the treatment on treated effects of the intervention (i.e., using the analytic sample of students). The first-level model for student  $i$  in teacher  $j$  is

$$Y_{ij} = \beta_{0j} + \beta_{1j}(\text{FEMALE})_{ij} + \beta_{2j}(\text{MINORITY})_{ij} + \beta_{3j}(\text{MOTHER EDU})_{ij} + \beta_{4j}(\text{PRE\_Y})_{ij} + \varepsilon_{ij}$$

where  $Y_{ij}$  represents four outcomes of interest (i.e., social studies learning, informational reading, informational writing, and motivation) for student  $i$  in teacher  $j$ .  $\text{FEMALE}_{ij}$  is a dummy variable

for gender, and  $\text{MINORITY}_{ij}$  is a dummy variable for minoritized status.  $\text{MOTHER\_EDU}_{ij}$  is equal to 1 if a student's mother has higher than a high school diploma.  $\text{PRE\_Y}_{ij}$  is the pre-assessments of the outcome. A student-specific residual is  $\varepsilon_{ij}$ . At the second-level the teacher specific intercepts are modeled as  $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{EXPERIMENTAL})_j + u_{0j}$  in which  $\gamma_{00}$  is the average outcome of students in the comparison group and  $u_{0j}$  is a teacher-specific random effect. The variance of  $u$  captures the nesting of students within teachers.  $\text{EXPERIMENTAL}$  is a dummy variable equal to 1 if a student was in the experimental group. The coefficient  $\gamma_{01}$  represents the average difference in the outcome between the two groups (adjusted for covariates).

Second, we examined the relationship between consistency with unit session plans and the outcomes. As explained earlier, each major components of each session observed was rated on a scale of 1 to 3, for a total score of 9 for a session that was quite consistent with key components of the session plan and a total score of 3 for a session that was not. The model used for the analysis was the same as the previous one shown in the previous section except that a) we dropped the  $\text{EXPERIMENTAL}$  variable, (b) only included experimental group students for the analysis, and c) added the  $\text{CONSISTENCY}$  variable at the teacher level (i.e., the second level).

## Results

Our report of results is organized into two major sections. The first addresses the first research question (about impact) and the second addresses the second research question (about relationship between consistency with session plans and student growth).

### Comparing Achievement

Observation data indicated that teachers randomly assigned to the experimental group did indeed implement PBL and that teachers randomly assigned to the comparison group did not

(mean score of 1.1 on the 1 to 3 scale described earlier). That is, the experiment tested what it was designed to test. Descriptive statistics for Experimental and Comparison Group students for all variables used in the multilevel analysis are reported in Table 2 at student level. Results of the multilevel analyses are reported in the paragraphs that follow.

**Social studies.** Controlling for female status, minoritized status, parent education, and pre-assessment, the experimental group scored statistically significantly higher than the comparison group on the social studies measure (Effect Size [ES] = 0.482,  $p < .001$  [two-tailed here and throughout]). That is, the mean difference between experimental and comparison groups in social studies was 0.482 standard deviations even after controlling for baseline scores. The Institute of Education Sciences What Works Clearinghouse considers an effect size of 0.25 or higher to be “substantively important” (2014, p. 23). See Table 3.

**Informational reading.** Controlling for female status, minoritized status, parent education, and pre-assessment, the experimental group scored statistically significantly higher than the comparison group on the informational reading measure (ES = 0.181,  $p = 0.085$ ). That is, the mean difference between experimental and comparison groups in informational reading was 0.181 standard deviations even after controlling for their baseline scores. By itself (without considering potential cumulative effects of PBL also being used for informational reading in other parts of the school day), this effect size is lower than the 0.25 threshold. See Table 3.

**Informational writing.** Controlling for female status, minoritized status, parent education, and pre-assessment, the experimental group did not score statistically significantly higher than the comparison group on the writing measure (ES = -0.045,  $p = 0.594$ ). See Table 3.

**Motivation.** Controlling for female status, minoritized status, parent education, and the pre-assessment, the experimental group declined less than the comparison group at a non-statistically significant level ( $ES = 0.135, p = 0.198$ ). See Table 3.

### **Relationship to Consistency with Unit Session Plans**

Descriptive statistics for teachers' consistency with unit session plans are provided in Table 4. Higher ratings mean that instruction was more consistent with key components of the session plans. In classrooms with the lowest average consistency with unit session plans, two common practices occurred: 1) significant reduction or elimination of one or more session components (and recall that each session contributed to children's enactment of the project) and 2) consistent disruptions to instruction due to off-task classroom behavior. Whole-class teaching was often substituted for the requested guided small group or partner instruction, perhaps in part due to struggles with classroom management. There was often little to no time at the close of a session for whole group review and reflection. In contrast, in classrooms with the highest average consistency with unit session plans, instruction was well paced and offered students time with whole-group instruction, regular participation in collaborative work with partners and small groups, and time for collective review and reflection. Higher consistency with unit session plans was associated with higher scores on all measures (see Table 3), with the following p-values and effect sizes—all above the previously cited Institute of Education Sciences 0.25 threshold for substantive importance: social studies ( $ES = 0.251, p = 0.309$ ), reading ( $0.562, p = 0.029$ ), writing ( $ES = 0.242, p = 0.080$ ), and motivation ( $ES = 0.287, p = .015$ ).

### **Discussion**

In primary-grade low-SES school settings, social studies and informational reading and writing are especially neglected, children are less likely to experience rigorous and ambitious

instruction, and children are less commonly positioned as capable, powerful change agents. For example, as explained earlier in the paper, studies of both social studies and literacy education in low- and high-SES settings find that children in low-SES settings are less likely to be provided with opportunities to write for an audience beyond the teacher, such as members of their local community. In contrast, we studied the impact of a curricular approach—Project-Based Learning—in which children did write for audiences other than their teacher, such as prospective residents of their community and a representative of their local government, and in other ways experienced rigorous and ambitious instruction, as defined earlier. We carried out this study in high-poverty, low-performing school districts with a student sample that was majority minority and included many children whose mother or guardian had no more than a high-school education. Although PBL has been the subject of considerable and valuable research, few studies in any setting have tested the impact of PBL with a randomized controlled trial research design, particularly in the early grades of schooling. This study was designed to help fill that gap by comparing the impact of teachers implementing, with some coaching support, a carefully designed version of four PBL units that address nearly all state second-grade standards for social studies and some second-grade standards for informational reading and writing to business-as-usual (but with a promise of teaching 80 lessons) instruction, which in nearly all cases involved either continued use of a (non-project-based) curriculum developed by two state education organizations or use of a national social studies textbook series.

Our test of PBL was designed to be stringent not only with respect to research methodology but also with respect to the circumstances in which PBL was enacted. The study was carried out in communities with a high proportion of children of poverty and a history of low student achievement in social studies, reading, and writing. Although an instructional

approach of this complexity most likely benefits from experience (e.g., Condliffe, 2016; Kokotsaki, et al., 2016), only one teacher participating in the study had previous experience implementing PBL, and data were collected in teachers' first year of PBL implementation. Teachers were provided with a limited amount of outside-of-classroom support, with a 3-hour initial professional development (PD) workshop and minimal subsequent webinar-based PD (~100 minutes total). This is ecologically valid as group PD time is relatively limited in high-poverty districts, and social studies is likely to be a low PD priority. Teachers were provided with more in-classroom support, with an average of 11 visits from a coach. This support is also ecologically valid in that high-poverty districts often have a cadre of instructional coaches. However, in order to ensure that we were testing implementation of PBL and not a general effect of coaching support, coaches played a limited role. They did not coach (e.g., model instructional practices) during sessions and were instructed to restrict their post-observation conversations with teachers to implementation of what was in the session-by-session unit plans, rather than larger issues of instruction or classroom management. In other words, we aimed to maximize ecological validity and minimize confounding factors. Still, it is important to recognize that what we tested was PBL with PD supports and not simply providing PBL unit or session plans alone.

Even in the challenging circumstances of this study, PBL proved to have a positive impact on social studies achievement ( $ES = 0.482$ ). That is, children performed substantially better, on average, on items that tap second graders' understanding of civics and government, economics, geography, and history (see sample items in the Methods section). Given that all four units center on social studies, an effect in that domain was most expected and is most promising. Indeed, the effect size in this domain is nearly twice what the Institute of Education Sciences What Works Clearinghouse considers to be "substantively important" (2014, p. 23). It represents



a 63% gain in social studies as compared to the comparison group. If translated into months of a school year, that would represent 5 to 6 months of greater learning.

In informational reading, children in the experimental group performed better, on average, than the comparison group. The measure in this area focused on student achievement of six of the ten second-grade CCSS for Reading Informational Text (standards 4 through 9), such as items that assess knowledge of informational text features and the ability to identify the reasons the author gives to support their point (see sample items in the Method section). In contrast to social studies, informational reading and writing were addressed in fewer sessions and should be addressed in other parts of the day as well (most notably in the English Language Arts block but also in science). Thus, a smaller effect size would be expected and indeed, the effect size for informational reading was 0.181. By itself (without considering potential cumulative effects of PBL also being used for informational reading in other parts of the school day, such as science and language arts), this effect size is lower than the 0.25 threshold noted earlier. It represents a 23% gain in informational reading over the comparison group. If translated into months of a school year, that would represent approximately 2 months of greater learning.

The fact that informational writing did not show even a small effect overall (there was an effect within consistency-with-unit-session-plans analyses, discussed later) was surprising given that each unit did involve writing; that findings from previous research indicate that students grow more when writing for authentic purposes (e.g., Purcell-Gates, Duke, & Martineau, 2007); and that research indicates that children write better for an audience beyond the teacher (e.g., Block & Strachan, 2018; Cohen & Riel, 1989). It is possible that the amount of writing and writing support included in the units simply was not sufficient for effects. The Institute of Education Sciences What Works Clearinghouse Practice Guide for *Teaching Elementary*

*Students to be Effective Writers* (Graham, Bollinger, et al., 2012) calls for 60 minutes per day of writing education, with half of that time devoted to instruction, whereas writing comprised only a portion of the 45-minute sessions in our units, was involved in only a subset of the 20 sessions within each unit, and shared an instructional focus with other domains. Perhaps a much greater amount of time and support is necessary within project-based units to affect writing, at least in contexts like those involved in this study in which some teachers shared that writing instruction was not a focus of their day. A second possibility is that implementation of the writing portions of the units was not sufficiently strong to impact writing. Students' scores in writing in both groups indicated that they were a long way from attaining their grade level's CCSS for Writing Standards 1 and 2. Some teachers may have struggled with writing instruction in general and/or with fully enacting the writing components of the units. A third possibility is that PBL simply is not an efficacious context for developing writing, although the findings regarding consistency with unit session plans (the greater the consistency, the higher the writing growth) draws that last possibility into question.

Motivation of students in the PBL classrooms appeared to decline less than in comparison classrooms ( $ES = 0.135$ ), but not at a level of statistical significance. This result may be seen as surprising in light of claims and some prior evidence about the positive motivational benefits of PBL. That said, as noted earlier in the Results section, the more consistent implementation was with unit session plans, the more positive the associated change in students' motivation. Further research should investigate under what circumstances PBL does and not show measurable motivational benefits in rigorous research designs.

Overall, causal inferences are warranted in this study because of the quality with which the experiment was conducted. There was no attrition at the cluster level and attrition at the

student level was low. Our post-hoc tests for baseline equivalence of observed covariates using the analytic sample suggested that random assignment was successful by and large and in agreement with the intention of the research design. In addition, attrition was not a threat to the internal validity of the results because its rate was low and because the students, teachers, and schools that eventually participated in the experiment in either the treatment or the comparison groups were very similar to those who initially participated in the random assignment process.

The results regarding consistency with unit session plans (research question 2) were similar across outcome measures. For each measure, enactment of more of the steps in the project-based unit session plans, such as providing information about or communication from the target audience, allocating time for children to carry out research, and reviewing key points from an earlier session, was associated with higher year-end achievement, controlling for pre-assessments and other factors. This association was statistically significant for informational reading, informational writing, and motivation. We hypothesize that it was not statistically significant for social studies because social studies was such a dominant focus that even if a teacher did not include as many of the key steps in unit session plans, there was still potential for considerable social studies growth. Given the findings in this study regarding consistency with unit session plans, future research might examine factors that enable and constrain teachers to greater or lesser enactment of key features of the design of project-based units or, more broadly, factors that characterize the practice of teachers whose students experience higher and lower growth within a project-based approach. Qualitative data collected as part of the project reported in this paper are analyzed in relation to these issues in Toledo et al. (2018).

### **Limitations**

Although internal validity of the study is strong in many respects (see previous section), a potential threat to the internal validity in the study was the fact that the comparison teachers taught, on average, 15 fewer social studies lessons/sessions than experimental group teachers despite requests from the researchers and promises by the teachers to teach the same number requested of the experimental group teachers. Although this difference is statistically significant, it does not appear that this could explain the results of the study. The relationship between the number of lessons/sessions taught and social studies growth was 0.011 and the relationship for reading was 0.008. In contrast, the effect sizes for achievement in each of these areas were 0.482 and 0.181 respectively. Within the range of number of social studies lessons/sessions taught in this study, it does not appear that the number of sessions is an influential variable.

The measures employed in the study might also be seen as a limitation in that they were researcher-developed. As noted, using researcher-developed measures for social studies was necessary because the few national standardized tests of social studies available for second graders are not aligned with state social studies standards. Similarly, at the time the study was conducted, there were no standardized tests of informational reading and writing specifically that were aligned with second-grade CCSS for informational reading and informational writing. For motivation, there were also no extant measures that addressed social studies, informational reading and writing, or integrated instruction so again, we had to develop the measure. To help mitigate the use of researcher-developed measures, we employed a number of mechanisms to establish validity and reliability, described in the Measures section earlier in the paper.

A potential limitation related to the external validity of our results regards the sample involved in the study. The 11 school districts and 20 elementary schools in our sample were selected using convenience sampling, which does not define a target population. That is, our data

do not represent the entire population of schools, teachers, or students in our geographic area and thus our results may not indicate an accurate depiction of the total population of teachers and students in second grade. We did not sample randomly from among all districts and schools in the geographic area nor even among the subset of districts and schools meeting our selection criteria (high levels of poverty and a history of low achievement on state assessments). For example, we did not consider small, rural school districts that may have had only one qualifying school. Schools, teachers, and students who participated in our experiment may be different from other schools in the same area. As a result, there is reason to be cautious about generalizing our results beyond the schools, teachers, and students who were part of our experiment.

Another limitation of the study is that we tested one specific version of PBL, described in detail earlier in the paper. This instantiation may differ in important ways from others' visions of PBL. For example, our projects involved addressing specific standards, including explicit instruction, and making use of domain-specific research-supported instructional practices, all characteristics that are typically not emphasized in the PBL literature. We also provided professional development support directly related to the units and provided detailed unit and session plans, which is not the case in all enactments of PBL. However, nearly all comparison group teachers also had the support of instructional materials—either a (non-project-based) curriculum developed by two state education organizations or a national social studies textbook series—and had experience in using them in previous years (which the experimental group teachers did not). Still, it is not possible to conclude from this study that PBL is always an effective instructional approach but rather than it *can* be effective and was, with regard to social studies learning and informational reading, in the manner in which we operationalized it.

Furthermore, we cannot be sure which aspects—or all aspects—of our version of PBL were responsible for the positive effects found.

Finally, results of this study might have been different had we examined PBL under less demanding conditions. We conducted the study in districts and schools facing many challenges, and we collected data in teachers' first year of implementation (as compared to comparison group teachers who had prior experience with the instructional materials and approach that they were using). Teachers' first year teaching any approach is likely to be less effective than subsequent years, and certainly in the case of an instructional approach as complex as PBL. Indeed, Marx and collaborators (2004) found that the effects of a project-based approach to science education that was implemented over a three-year period increased over time. Had we carried out random assignment when we did but waited a year, or two or three to actually collect pre- and post-test data from students, we might have gotten larger effects.

### **Implications**

This study offers several implications for policy, practice, and research. First, the study suggests that curriculum developers and practitioners should not shy away from using a project-based approach, at least as enacted in this study. There were some benefits of using the approach even in teachers' first year of implementation and even as compared to comparison classrooms using either state-developed or nationally recognized curriculum materials. Second, the study provides further reason to address the discrepancies in educational practices in low- versus high-SES settings documented in previous studies. Children in low-SES settings were more successful, not less so, in a curricular context in which they were provided with opportunities to read and write in a content area, lead some of their educational activities, inquire, make some choices in their reading, exercise some authorial control in their writing, and write for audiences

beyond the teacher. Positioning young students as change agents in their local communities did not diminish their growth in knowledge of grade-level content and skills. Third, individuals at all levels in the educational system should seek opportunities to simultaneously develop social studies and literacy. Although this is certainly not a new idea, it is relatively rarely enacted in primary-grade education and enjoys empirical support in this study. Fourth, curricular designers should examine the ways in which we provided both detailed curriculum support and flexibility that allowed practitioners to tailor aspects of projects to their local community and to teacher and student interests, as this is somewhat unusual in curriculum development, particularly around PBL. Full unit and session plans for all four units are available at no cost at: [omitted for blind review]. Fifth, policymakers and administrators should consider how to provide appropriate professional development support around PBL. This test of PBL occurred with 3 hours of initial PD, ~100 minutes of subsequent webinar-based PD, and, most importantly, an average of 11 visits from instructional coaches (although, again, their coaching was considerably constrained compared to typical coaching support). We do not know whether PBL would have been successful without these supports (nor whether it would have been more successful with additional supports). Sixth, the field should investigate what kinds of professional development can best support teachers in implementing PBL in a manner that is relatively consistent with unit session plans, as teachers who did so in this study had students who showed greater growth. Finally, researchers should test the impact of PBL in other grade-level and content-area contexts and carry out studies around the perception and implementation of PBL by teachers in different contexts and with different levels of student growth.

## **Conclusion**

Despite being tested under challenging conditions, a project-based approach as enacted in this study, with PD supports, had some positive effects on a low-SES majority minority sample of second graders' development in social studies and literacy. There is sufficient promise to continue implementation and investigation of PBL in the primary grades in low-SES settings as a means to address the often-neglected domains of social studies and informational reading and writing, to provide rigorous and ambitious instruction, and to position students as capable, powerful agents of change in their community.



### References

- Anyon, J. (1981). Social class and school knowledge. *Curriculum Inquiry*, 11, 3-42.
- Aral, N., Kandir, A., Ayhan, A. B., & Yaşar, M. C. (2010). The influence of project-based curricula on six-year-old preschoolers' conceptual development. *Social Behavior and Personality: An International Journal*, 38(8), 1073-1079.
- Au, W. (2012). *Critical curriculum studies*. New York: Routledge.
- Barron, B. J. S., Schwartz, D. L., Vye, N. J., Moore, A., Petrosino, A., Zech, L., & Bransford, J. D. (1998). Doing with understanding: Lessons from research on problem- and project-based learning. *The Journal of the Learning Sciences*, 7(3-4), 271-311.
- Barrows, H. S. (1996). Problem-based learning in medicine and beyond: A brief overview. *New Directions for Teaching and Learning*, (68), 3-12.
- Beneke, S., & Ostrosky, M. M. (2009). Teachers' views of the efficacy of incorporating the project approach into classroom practice with diverse learners. *Early Childhood Research & Practice*, 11(1). Retrieved from <http://ecrp.uiuc.edu/v11n1/ostrosky.html>
- Billman, A. K. (2008). *Inquiry-based instruction in very high- and very low-SES second grade classrooms* (Unpublished doctoral dissertation). Michigan State University, East Lansing, MI.
- Block, M. K., & Strachan, S. L. (2018). *The impact of external audience on second graders' writing quality*. Manuscript submitted for publication.
- Boaler, J. (1997). *Experiencing school mathematics: Teaching styles, sex, and settings*. Buckingham, UK: Open University Press.

- Brush, T., & Saye, J. (2014). An instructional model to support problem-based historical inquiry: The persistent issues in history network. *Interdisciplinary Journal of Problem-Based Learning*, 8(1). Doi: 10.7771/1541-5015.1409
- Bryk, A., & Raudenbush, S. W. (1992). *Hierarchical linear models for social and behavioral research: Applications and data analysis methods*. Newbury Park, CA: Sage.
- Chi, B., Jastrzab, J., & Melchior, A. (2006). *Developing indicators and measures of civic outcomes for elementary school students*. CIRCLE Working Paper 47. Medford, MA: The Center for Information & Research on Civic Learning & Engagement.
- Chu, S. K. W., Tse, S. K., & Chow, K. (2011). Using collaborative teaching and inquiry project-based learning to help primary school students develop information literacy and information skills. *Library and Information Science Research*, 33(2), 132-143.  
doi:10.1016/j.lisr.2010.07.017
- Cohen, M., & Riel, M. (1989). The effect of distant audience on students' writing. *American Educational Research Journal* 26(2 (1989): 143-159.
- Condliffe, B. (2016). *Project-based learning: A literature review*. Unpublished manuscript, George Lucas Educational Foundation, San Rafael, CA. Available from <https://s3-us-west-1.amazonaws.com/ler/MDRC+PBL+Literature+Review.pdf>
- Davis, E. A., & Krajcik, J. S. (2005). Designing educative curriculum materials to promote teacher learning. *Educational Researcher*, 34(3), 3-14.
- Dewey, J. (1902). *The child and curriculum*. Chicago, IL: The University of Chicago Press.
- Drake, C., Land, T. J., & Tyminski, A. M. (2014). Using educative curriculum materials to support the development of prospective teachers' knowledge. *Educational Researcher* 43(3), 154-162. doi:10.3102/0013189X14528039

- Dresden, J., & Lee, K. (2007). The effects of project work in a first-grade classroom: A little goes a long way. *Early Childhood Research & Practice, 9*(1). Retrieved from <http://ecrp.uiuc.edu/v9n1/dresden.html>
- Duke, N. K. (2000a). 3.6 minutes per day: The scarcity of informational texts in first grade. *Reading Research Quarterly, 35*, 202-224.
- Duke, N. K. (2000b). For the rich it's richer: Print experiences and environments offered to children in very low- and very high-socioeconomic status first-grade classrooms. *American Educational Research Journal, 37*(2), 441-478.
- Dusek, J. B., & Joseph, G. (1983). The bases of teacher expectancies: A meta-analysis. *Journal of Educational Psychology, 75*, 327-346.
- Eisner, E. W. (1985). *The educational imagination: On the design and evaluation of school programs*. New York: Macmillan.
- Fitchett, P. G., & Heafner, T. L. (2010). A national perspective on the effects of high-stakes testing and standardization on elementary social studies marginalization. *Theory and Research in Social Education, 38*(1), 114-130.
- Geier, R., Blumenfeld, P. C., Marx, R. W., Krajcik, J. S., Fishman, B., Soloway, E., & Clay-Chambers, J. (2008). Standardized test outcomes for students engaged in inquiry-based science curricula in the context of urban reform. *Journal of Research in Science Teaching, 45*(8), 922-939.
- Gijbels, D., Dochy, F., Van den Bossche, P., and Segers, M. (2005). Effects of problem-based learning: A meta-analysis from the angle of assessment. *Review of Educational Research, 75*, 27-61. doi: <http://www.jstor.org/stable/3516079>

- Graham, S., Bollinger, A., Booth Olson, C., D'Aoust, C., MacArthur, C., McCutchen, D., & Olinghouse, N. (2012). *Teaching elementary school students to be effective writers: A practice guide* (NCEE 2012- 4058). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education. Retrieved from [http://ies.ed.gov/ncee/wwc/publications\\_reviews.aspx - pubsearch](http://ies.ed.gov/ncee/wwc/publications_reviews.aspx-pubsearch).
- Guven, Y., & Duman, H. G. (2007). Project based learning for children with mild mental disabilities. *International Journal of Special Education*, 22(1), 77-82.
- Habok, A. (2015). Implementation of a project-based concept mapping developmental programme to facilitate children's experiential reasoning and comprehension of relations, *European Early Childhood Education Research Journal*, 23, 129-142, doi: 10.1080/1350293X.2014.991100
- Halvorsen, A., Duke, N. K., Brugar, K. A., Block, M. K., Strachan, S. L., Berka, M. B., & Brown, J. M. (2012). Narrowing the achievement gap in second-grade social studies and content area literacy: The promise of a project-based approach. *Theory and Research in Social Education*, 40, 198-229.
- Halvorsen, A., Duke, N. K., Strachan, S. L., & Johnson, C. (2018). Engaging the community with a project-based approach. *Social Education*, 82, 24-29.
- Harris, C. J., Penuel, W. R., DeBarger, A. H., D'Angelo, C., & Gallagher, L. P. (2014). *Curriculum materials make a difference for next generation science learning: Results from Year 1 of a randomized controlled trial*. Menlo Park, CA: SRI International.
- Holm, M. (2011). Project-based instruction: A review of the literature on effectiveness in prekindergarten through 12th grade classrooms. *River Academic Journal*, 7(2), 1-13.

- Jeong, J., Gaffney, J. S., & Choi, J.-O. (2010). Availability and use of informational texts in second-, third-, and fourth-grade classrooms. *Research in the Teaching of English, 44*, 435-456.
- Kaldi, S., Filippatou, D., & Govaris, C. (2011). Project-based learning in primary schools: effects on pupils' learning and attitudes. *Education 3-13, 39*(1), 35-47.
- Karaçalli, S., & Korur, F. (2014). The effects of project-based learning on students' academic achievement, attitude, and retention of knowledge: The subject of 'electricity in our lives.' *School Science and Mathematics, 114*, 224–235.
- Kilpatrick, W. H. (1918). The project method. *Teachers College Record, 19*, 319–334.
- Kliebard, H. (2004). *The struggle for the American curriculum 1893–1958* (3rd ed.). New York: Routledge.
- Kokotsaki, D., Menzies, V., & Wiggins, A. (2016). Project-based learning: A review of the literature. *Improving Schools, 19*(3) 267-277.
- Krajcik, J. S., Blumenfeld, P., Marx, R. W., Bass, K. M., Fredricks, J., & Soloway, E. (1998). Middle school students' initial attempts at inquiry in project-based science classrooms. *Journal of the Learning Sciences, 7*(3&4), 313-350.
- Lampert, M., & Graziani, F. (2009). Instructional activities as a tool for teachers' and teacher educators' learning. *The Elementary School Journal, 109*(5), 491–509.
- Larmer, J. Mergendoller, J., & Boss, S. (2015). *Setting the standard for project based learning: A proven approach to rigorous classroom instruction*. Alexandria, VA: ASCD.
- MacArthur, C. A., Ferretti, R. P., & Okolo, C. M. (2002). On defending controversial viewpoints: Debates of sixth graders about the desirability of early 20<sup>th</sup>-century American immigration. *Learning Disabilities Research and Practice, 17*(3), 160-172.

- Marx, R. W., Blumenfeld, P. C., Krajcik, J. S., Fishman, B., Soloway, E., Geier, R., & Tal, R. T. (2004). Inquiry-based science in the middle grades: Assessment of learning in urban systemic reform. *Journal of Research in Science Teaching*, 41(10), 1063-1080.
- McDowell, M. (2017). *Rigorous PBL by design: Three shifts for developing confident and competent learners*. Thousand Oaks, CA: Corwin.
- McGuire, M. E. (2007). What happened to social studies? The disappearing curriculum. *Phi Delta Kappan*, 88, 620-624.
- McKenna, M. C., & Kear, D. J. (1990). Measuring attitude toward reading: A new tool for teachers. *The Reading Teacher*, 43, 626-639.
- Mitra, D., & Serriere, S. (2012). Student voice in elementary-school reform: Extending youth development to elementary students. *American Educational Research Journal*, 49(4), 743-774.
- National Council for the Social Studies (2013). *The college, career, and civic life (C3) framework for social studies state standards: Guidance for enhancing the rigor of K-12 civics, economics, geography, and history*. Silver Spring, MD: Author.
- National Governors Association Center for Best Practices [NGA], & Council of Chief State School Officers [CCSSO]. (2010). *Common core state standards for English language arts & literacy in history/social studies, science, and technical subjects*. Washington DC: National Governors Association for Best Practices, Council of Chief State School Officers.
- Pace, J. L. (2012). Teaching literacy through social studies under No Child Left Behind. *The Journal of Social Studies Research*, 36(4), 329-358.

- Parker, W., Mosborg, S., Bransford, J., Vye, N., Wilkerson, J., & Abbott, R. (2011). Rethinking advanced high school coursework: Tackling the depth/breadth tension in the AP US Government and Politics course. *Journal of Curriculum Studies, 43*, 533–559.
- Parker, W., Lo, J., Yeo, A.J., Valencia, S. W., Nguyen, D., Abbott, R. D. . . . Vye, N.J. (2013). Beyond breadth-speed test: Toward deeper knowing and engagement in an Advanced Placement course. *American Educational Research Journal, 50*(6), 1424-1459.
- Purcell-Gates, V., Duke, N. K., & Martineau, J. A. (2007). Learning to read and write genre-specific text: Roles of authentic experience and explicit teaching. *Reading Research Quarterly, 42*, 8-45.
- Robinson, A., Dailey, D., Hughes, G., & Cotabish, A. (2014). The effects of a science-focused STEM intervention on gifted elementary students' science knowledge and skills. *Journal of Advanced Academics, 25*(3), 189-213. doi:10.1177/1932202X14533799
- Snedden, D. (1916). The “project” as a teaching unit. *School and Society, 4*, 419-423.
- Strachan, S. L. (2018). *Missed opportunities: Literacy and social studies integration in low- and high-SES elementary classrooms*. Unpublished manuscript, Michigan State University, East Lansing, Michigan.
- Stroupe, D., DeBarger, A., & Warner, N. (2016). *Making project-based learning actionable with ambitious instruction*. Unpublished manuscript. San Rafael, CA: George Lucas Educational Foundation.
- Sylvester, P. S. (1994). Elementary school curricula and urban transformation. *Harvard Education Review, 64*(3), 309-332.
- Thomas, J. W. (2000). *A review of research on project-based learning*. San Rafael, CA:

The Autodesk Foundation. Retrieved from:

[http://www.bobpearlman.org/BestPractices/PBL\\_Research.pdf](http://www.bobpearlman.org/BestPractices/PBL_Research.pdf)

Thompson, J., Windschitl, M., & Braaten, M. (2013). Developing a theory of ambitious early-career teacher practice. *American Educational Research Journal*, 50(3), 574-615. doi: 10.3102/0002831213476334

Toledo, W., Hughes, R., Duke, N. K., Halvorsen, A., & Strachan, S. L. (2018). *Practices of teachers whose students experience high and low growth in the context of project-based learning*. Unpublished manuscript, University of Michigan, Ann Arbor, Michigan.

Tretten, R., & Zachariou, P. (1995). *Learning about project-based learning: Self-assessment preliminary report of results*. San Rafael, CA: The Autodesk Foundation

VanFossen, P. J. (2005). "Reading and math take so much time...": An overview of social studies instruction in Indiana. *Theory and Research in Social Education*, 33(3), 376-403.

Vogler, K. E., Lintner, T., Lipscomb, G. B., Knopf, H., Heafner, T. L., & Rock, T. C. (2007). Getting off the back burner: Impact of testing elementary social studies as part of a state-mandated accountability program. *Journal of Social Studies Research*, 31(2), 20-34.

What Works Clearinghouse. (2014). *What Works Clearinghouse Procedures and Standards Handbook Version 3.0*. Washington, DC: Author. Retrieved from [https://ies.ed.gov/ncee/wwc/Docs/referenceresources/wwc\\_procedures\\_v3\\_0\\_standards\\_handbook.pdf](https://ies.ed.gov/ncee/wwc/Docs/referenceresources/wwc_procedures_v3_0_standards_handbook.pdf)



Table 1

*Demographic Information about Teachers and Students at the Teacher/Class Level and Raw**Pre-measure Results*

	Mean		Standard Deviation		N	T-test	
	E	C	E	C		E	C
<b>Teacher characteristics</b>							
Years of teaching experience	16.67	17.29	2.01	1.74	24	24	0.24
PD in PBL	0.13	0.29	0.07	0.09			1.42
<b>Student characteristics</b>							
Mother's education	0.471	0.485	0.119	0.182	24	24	0.302
Female	0.491	0.540	0.137	0.143	24	24	1.222
Minoritized	0.574	0.587	0.243	0.291	24	24	0.156
Primary lang. other than English	0.065	0.102	0.127	0.236	24	24	0.670
<b>Student Pre-assessments</b>							
Social Studies	0.253	0.251	0.051	0.035	24	24	0.159
Informational reading	0.264	0.268	0.070	0.065	24	24	0.167
Informational writing	0.204	0.194	0.056	0.059	24	24	0.634
Motivation	0.786	0.801	0.043	0.048	24	24	1.159

Notes: E = Experimental, C = Control; Mothers' education, female, minoritized, and PD in PBL are dummy variables. Mother's education is equal to 1 if a student's mother or guardian has higher than high school diploma. Female is equal to 1 if a student is female and 0 if a student is male. Minoritized is equal to 1 if a student is from a racial group underrepresented in U.S. higher education (not White or Asian) and 0 otherwise. In the sample, 40.337 % of the students were White, 32.975% were Black or African American; 15.491% were multi-racial; 5.368% were Asian; and 4.448% were Hispanic or Latino. Pre-and post-measures are expressed as percentage scores that each student achieved compared to the highest possible scores. Student characteristics and pre-assessments are aggregated at the teacher level, and t-tests were conducted at the teacher level, as that is the unit of random assignment. Measures are after attrition took place.

\* $p < .05$  \*\* $p < .01$  \*\*\* $p < 0.001$

Table 2

*Descriptive Statistics for Variables of Interest at the Student Level: Entire Sample*

	<b>Mean</b>		<b>Standard Deviation</b>		<b>N</b>	
	E	C	E	C	E	C
<b>Student characteristics</b>						
Mother's education	0.466	0.496	0.500	0.501	358	272
Female	0.500	0.526	0.501	0.500	358	272
Minoritized	0.550	0.598	0.498	0.491	347	256
Primary lang. other than English	0.060	0.080	0.238	0.273	351	261
<b>Pre-assessments</b>						
Social Studies	0.250	0.252	0.122	0.114	308	248
Informational reading	0.263	0.270	0.140	0.131	306	251
Informational writing	0.198	0.194	0.163	0.161	334	256
Motivation	0.782	0.805	0.115	0.116	329	256
<b>Post-assessments</b>						
Social Studies	0.445	0.370	0.172	0.136	305	257
Informational reading	0.444	0.419	0.175	0.161	307	252
Informational writing	0.298	0.298	0.187	0.188	349	264
Motivation	0.782	0.774	0.123	0.128	343	265

*Note.* The values are at the student level and exclude the attrition group. E = Experimental, C = Control; Mothers' education, female, minoritized, and PD in PBL are dummy variables.

Table 3

*Intervention Effects and the Relationship between Consistency with Unit Session Plans and Children's Achievement*

	<b>Coefficient</b>	<b>SE</b>	<b>P-value</b>	<b>Effect Size</b>	<b>Observations</b>
Effects of intervention					48 teachers 20 schools
Social Studies	0.078	0.018	<0.001***	0.482	522
Informational Reading	0.031	0.018	0.085†	0.181	521
Informational Writing	-0.007	0.014	0.594	-0.045	580
Motivation	0.017	0.013	0.198	0.135	542
Relationship of consistency with unit session plans					24 teachers 20 schools
Social Studies	0.043	0.042	0.309	0.251	290
Informational Reading	0.098	0.045	0.029*	0.562	291
Informational Writing	0.041	0.023	0.080†	0.242	333
Motivation	0.037	0.015	0.015*	0.287	308

† $p < .10$  \* $p < .05$  \*\* $p < .01$  \*\*\* $p < .001$  (All tests are two-tailed.)

Table 4

*Experimental Group Teachers' Consistency with Unit Session Plans, as Scored by Observers, for the Three Parts of the Lesson*

Teacher ID	Whole Group Instruction and Discussion		Guided Small Group or Individual Instruction		Whole Group Review and Reflection	
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>
2	2.643	(.497)	2.786	(.426)	2.000	(.877)
3	2.500	(.707)	2.700	(.675)	1.900	(.876)
4	1.333	(.500)	1.667	(.866)	1.222	(.667)
6	2.500	(.798)	2.500	(.798)	1.333	(.779)
7	2.900	(.316)	2.600	(.699)	2.400	(.699)
11	2.923	(.277)	2.692	(.630)	2.462	(.877)
12	2.846	(.376)	2.692	(.630)	2.538	(.776)
13	2.091	(.700)	1.909	(.302)	1.364	(.505)
19	2.889	(.333)	2.889	(.333)	2.111	(1.054)
24	3.000	(0)	2.917	(.289)	2.667	(.492)
25	3.000	(0)	2.900	(.316)	2.800	(.422)
28	2.571	(.513)	2.429	(.646)	2.571	(.756)
31	2.692	(.630)	2.308	(.855)	1.692	(.751)
34	2.700	(.675)	2.600	(.699)	2.100	(.738)
40	2.300	(.483)	2.000	(.471)	1.600	(.516)
41	2.000	(0)	2.333	(.816)	1.500	(.837)
42	3.000	(0)	2.857	(.378)	2.000	(.816)
43	2.222	(.441)	2.444	(.527)	1.444	(.726)
44	3.000	(0)	2.917	(.289)	2.583	(.669)
45	2.375	(.806)	2.625	(.619)	2.333	(.816)
48	3.000	(0)	2.917	(.289)	2.833	(.389)
49	2.307	(.751)	2.538	(.519)	1.538	(.660)
52	2.769	(.439)	2.692	(.480)	2.077	(.862)
53	2.727	(.647)	2.545	(.688)	2.000	(.894)
<b>TOTAL</b>	<b>2.595</b>	<b>(0.401)</b>	<b>2.561</b>	<b>(0.552)</b>	<b>2.045</b>	<b>(0.727)</b>

*Note.* 1=follows fewer than 50% of the steps in the session plan for that section of the session, 2 = follows 50% - 80% of the steps, 3 = follows 80% or more of the steps for that section of the session. Mean Fleiss' Kappa for interrater reliability of .66, which indicates substantial agreement.

## Appendix A

**Producers and Producing in Our Community (Economics):** This 20-session interdisciplinary project involves students in determining an unmet economic want in their school community and producing and distributing a good or service to meet that want, with profits going to a cause identified by the students. The project teaches students economic concepts (e.g., *business, producer, consumer, goods, services, natural, human, and capital resources, scarcity, trade, profit, loss, opportunity cost, wants, and specialization*) and content literacy skills. With the ultimate goal of selling their own good or service, students begin by studying some key economics concepts and the goods or services a local business produces or provides, the resources needed to produce those goods or provide those services, the means of distributing those goods or services, and the market for those goods or services. Students then take a field trip (or a virtual field trip) to a local business during which they learn first-hand about how the business identified an unmet economic want and how the business engages in production and distribution. Students write an informational flier about the business for the business to distribute to customers. Students then draw upon what they learned studying the local business to develop their own good or service to sell. Students write advertisements for their good or service, as well as procedural or how-to text about how to make the good or provide the service. Through the unit's writing experiences, students develop their knowledge of persuasive (the advertisements) and informative/explanatory text (the flier and the procedural or how-to text). Along the way, they are also engaged in reading a number of informational texts.

**Brochure about the Local Community (Geography):** In this 20-session interdisciplinary project, each student creates his or her own brochure that includes a map of several student-selected human and natural characteristics of the local community. The target audience for the brochure is people who are visiting or considering moving to the community. To reach that audience, brochures are given to a person or group that interacts with people considering visiting or moving to a community (e.g., the community's visitors bureau, real estate agents, representatives from local chamber of commerce). Through the study of their community, students learn about the geographical concepts of human and natural characteristics, the ways humans both positively and negatively affect the natural environment, cultural diversity, movement (of people, goods, and ideas), and urban/suburban/rural environments. They also learn about land use: different purposes for land (e.g., residences, farming, industry, commercial). Students reinforce their understanding of these geographical concepts by examining similarities and differences between their community and another community. During the course of the project, as students create a detailed map of their community, they also develop skills in map construction and map reading (understanding and applying the following map features: key/legend, direction, distance, relative location, and scale). Students study state maps to locate their community and learn that it is part of a larger series of communities (e.g., county and state). Through developing the brochure, students develop their skill in reading informative/explanatory text and their skill in writing persuasive text.

**Postcards about the Community's Past (History):** In this 20-session interdisciplinary project, each student creates a set of historical postcards about the local community that could be sold, displayed in the community (e.g., at a local historical museum), or given to community members. On one side of each postcard is an image of community life in the past and on the other side is a

short informative/explanatory text written by the student that includes an introduction, facts and definitions about the topic, and a conclusion. In the course of the project, students learn historical content (the history of their local community) and historical thinking skills (chronological thinking and primary source interpretation) by studying the following aspects of life in the history of their community: schooling, transportation, and other noteworthy aspects of the community. Students read a variety of informational texts during the unit, including informative/explanatory texts, procedural texts, and biographies. As they learn about different aspects of community life, and how they have changed over time, students learn how to “do the work” of historians: how to create and interpret a timeline and how historians make sense of the past through the examination and analysis of sources (such as objects from the past, photographs, and interviews with older family members or friends). Students also learn how individuals work to address problems in their community and about ways individuals make significant and lasting contributions. In addition, students develop an understanding of point of view/perspective, and how point of view/perspective influences the ways in which people interpret events.

**The Park/Public Space Proposal Project (Civics and Government):** This 20-session interdisciplinary project involves students in writing a proposal to improve a local park or public space in ways that enhance its value and use for community members. Students create and deliver a persuasive multimedia presentation for a local governmental official (e.g., a city council member or a representative from the city parks and recreation department). They also write their own letters for the government official to distribute to other government personnel. The presentation and letter use information obtained from a survey that is created by the students to assess what members of the local community think about a local park or public space and how it should be improved. During the unit, students learn about the purposes of government and about the responsibilities of both citizens and the local government. They also learn what a public issue is and why people can have different opinions about an issue. They read informational texts about civic leaders, responsibilities of the local government, and effective communication skills. Students develop their writing skills and their public speaking skills and expand their use of technology as a medium of research and communication. Students use the letter writing and presentation skills developed in this unit to effectively communicate with community members about the reasons for improving a community park or public space, using data to support their findings. In summary, students learn through the project that—and how—they can play an active role in improving their local community.