Abstract Name: Peer-Enabled Restructured Classrooms: A Field Trial Experiment Leading to a Successful Model for the Urban Classroom
MSP Project: Math and Science Partnership in New York City
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1. Questions(s) or issue(s) for dialogue at Learning Network Conference session:

   It takes a village to raise a child. In what ways are we creating the village to educate the urban child? Do we need to dramatically restructure the classroom?

   Is high school reform a Sisyphean challenge doomed to failure unless preceded by elementary or middle school reform?

2. Context of the work within the STEM education literature and within your MSP project:

   There is a long history of using peers to teach other students, with applications in a range of age groups and subject areas (Topping and Ehly 1998). The most common peer tutoring models are supplemental to the classroom. For example, many schools routinely offer after-school or lunch-time peer tutoring sessions. In some cases, aspects of the classrooms are modified. The inclusion of peer-led workshops or problem-solving sessions have been shown to improve student success in these classroom. However, in all of these examples, peer tutoring does not redesign the roles of the teachers or students nor does it redesign how learning occurs in the classroom. The most prominent exception to this is Classwide Peer Tutoring (CWPT) (Greenwood, Delquadri et al. 1989; Maheady, Mallette et al. 2006). CWPT is reciprocal same-age peer teaching, where children who are all students enrolled in the same class are teaching each other in dyads. Regardless of the specific implementation, all peer tutoring implementations have a demonstrated impact on the peer tutors themselves and often on the student tutees. In fact, peer tutoring appears to be a robust mechanism to improve student learning but has rarely been used to dramatically change classroom practice.

   In 2004, the City University of New York (CUNY) in partnership with the NYC Department of Education (DOE) was awarded a Math Science Partnership grant from the National Science Foundation. Dubbed MSPinNYC, Hunter College was the lead CUNY school and Regions 1, 2, and 9 were the DOE leads. The project targeted high school math and science teaching and learning with the explicit goal of raising student Regents scores. Eight high schools were selected to form the "Hub" of the MSPinNYC. A key aspect of the project was summer schools run on CUNY campuses for Hub students who had failed the June Regents exam. Student success at the CUNY summer schools was typically two to eight times that of school-based summer schools. In such an atypical summer school, student satisfaction was high with students
excited, engaged, and with at least 65%, and in some cases 100%, of the students passing the August Regents exams in Math A, Integrated Algebra, Chemistry, or Living Environment at, or above, the 65 level. The primary research and evaluation focus of the first three years, from which PERC emerged, was to determine which strategies used during the summer were critical for student success, and were also portable into the schools for use during the academic year.

Peer teachers emerged as the primary agent of influence identified by students in interviews, focus groups, and surveys conducted at the end of the summer schools. The emphasis on the importance of peer teachers was echoed by teacher focus groups. Based on these ideas, a model to change classroom instruction during the academic year, called the Peer Enabled Restructured Classroom (PERC) model was developed. This model uses students who have previously passed the course as peer teachers. In this model the teacher actually does little direct teaching to the class. Rather, the teacher learns to work through the student peer teachers, effectively teaching through the peers. Activities designed by the teacher are used by the peer teachers to engage and support learning in the classroom. The role of the teacher changes from one primarily defined by supporting learning through direct interaction with students to that of being an effective manager.

While initial student outcomes have been encouraging, the research literature identifies teacher quality as the primary factor that influences student performance. Intrigued by this apparent discrepancy, the MSPinNYC research team focused on reconciling these perspectives.

3. Claim(s) or hypothesis(es) examined in the work (anticipating that veteran projects will have claims, newer projects will have hypotheses):

CLAIM #1: The problems facing teachers in the urban science or math high school classroom are daunting. It is possible that the urban classroom has become so complex that it is unreasonable to expect a typical teacher to produce the required student outcomes. Just as the medical operating room is considered too complicated for a single physician to manage, it is our assertion that the urban high school science or mathematics classroom has become too complicated to expect a typical teacher to be successful. Even with exceptional teacher education programs and successful, albeit slow, professional development programs we postulate that it is impossible to build a workforce that relies upon the traditional classroom. Additional innovative solutions must be found.

CLAIM #2: Peer Enhanced Restructured Classroom (PERC) is a robust model for urban schools that contributes to closing the Achievement Gap.

CLAIM #3: PERC changes the participating teachers’ concepts of what it means to teach and to be a teacher.

CLAIM #4: Effective peer teachers can be drawn from all academic cohorts including high performing, middle performing, and previously failing students. The peer teaching experiences produce profound changes in the peer teachers’ self concept and academic preparedness.

CLAIM #5: A theory-based integrative model for motivation and learning (Levesque, 2006) can provide a context to understand why the PERC model is such a robust and effective classroom
model. The PERC model is effective in satisfying the students' basic psychological needs of competence, autonomy, and relatedness.

**CLAIM #6:** The PERC model benefits ELL students even when teachers have not been trained in specific literacy strategies.

4. Evaluation and/or research design, data collection and analysis:

The persistence of low graduation rates and poor student achievement in mathematics and science at the high school level in New York City (and other urban areas) and the numbers of difficulties faced by the urban teacher led to claim #1. Evidence to support Claim #1 is found in the student outcomes in urban classrooms across the country. The MSPinNYC summer schools student achievement results clearly demonstrates the possibility of improved outcomes with the same student population. In all cases, the MSPinNYC classrooms, which targeted highly underperforming students, had multiple instructional staff members. Despite huge ranges in instructional quality, student performance remained high prompting one Advisory Committee member to suggest that it might be unreasonable to expect a single teacher to succeed in a typical urban classroom.

Staffing a classroom with multiple teachers is an expensive proposition even in flush financial times. The PERC model, on the other hand, enables teachers to use "assistants" in the classroom with little additional expense. However teachers must be willing to re-envision their roles and the schools must be willing to invest time and energy in identifying and programming students to be tutors. Such programming issues are significant and schools are reluctant to consider such implementation without data indicating the success of the model. Thus we designed a comprehensive field trial to research and evaluate the model.

In the 2008-2009 Academic year, we ran a pilot field trial that involved four high schools, eleven teachers, and over 600 students in a large urban system, New York City. The classrooms of two academic courses of study were restructured using the Peer-enhanced Classroom. The Integrated Algebra and Living Environment Regents courses were selected for this field trial because their scores serve, in part, as proxies for graduation rates. Students must pass the Integrated Algebra exam and must pass one science exam, usually Living Environment, to graduate. Most students in Integrated Algebra and Living Environment were in 10th grade although some classes include repeaters and some classes include 9th graders. Both Integrated Algebra and Living Environment were designed to be one year curricula to be completed in the 9th or 10th grade.

The selection of the schools involve several criteria including 1) statistical data reflecting substantial room for growth in student performance, 2) high poverty needs as reflected in free-lunch availability, 3) serious interest among teachers with at least two teachers excited to participate, and 4) administrative commitment to address the programming and selection of tutors and provide appropriate support for the teachers. The last criteria can be difficult for schools to provide but is essential to the field trial. The four selected schools fit all of the criteria. The schools included two small schools with one specializing in English language learners and two large schools.
Within the context of the field trial, we conducted four research studies. In the first, we examined student performance on the state-mandated exams (Regents exams) and compared the experimental results with the control results. We conducted three qualitative studies of students, tutors, and teachers. Furthermore, we probed the students to determine why the model is successful and to assess the impact of the model of ELLs students as a subgroup.

**Analyses and Findings**

The Regents Exam results from the 2008-2009 pilot field trial are shown below. The combined average improvement in Regents passing rate was found to be 22.8% relative to the controls. In other words, 22.8% more students passed at the required 65 level in the 11 classes than in the control (traditional classroom model) sections.

### June Passing Rates of Students Sitting for the New York State-Mandated Regents Exam in Integrated Algebra or Living Environments

<table>
<thead>
<tr>
<th>Trial</th>
<th>School</th>
<th>Teacher</th>
<th>Subject</th>
<th>Experimental N</th>
<th>65-100</th>
<th>Control N</th>
<th>65-100</th>
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<td>1</td>
<td>Math</td>
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<td>42.7%</td>
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<tr>
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<td>2</td>
<td>Math</td>
<td>82</td>
<td>67.1%</td>
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<td>42.7%</td>
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<td>2</td>
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<tr>
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<td>3</td>
<td>1</td>
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<td>56.0%</td>
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<td>30.3%</td>
<td>193</td>
<td>19.7%</td>
<td>A</td>
</tr>
</tbody>
</table>

The control in a field trial is particularly challenging. In a trial of this complexity, it is difficult to create a control group that varies in only one variable from the experimental. Nevertheless, two types of controls were sought. In control type "A", students are randomly placed into the experimental versus control class, but the two classes are taught by different teachers -- introducing an additional variable. In control type "B", the control classes are taught by the same teacher in a traditional classroom. In both control types, long-term trends in Regents passing rates at particular schools are known and thus reasonable expectations can be constructed. Lastly, in control type "C" the student population is not the same in the control and experimental classes. For example, in Trial 4 the students in the experimental group were all repeating students who had failed the exam the prior year, while only a small number of the control group students were repeaters.

Qualitative studies using interviews and surveys unambiguously indicate that: 1) the summer learning environment, which relies heavily on peer teachers, better satisfied \( p \leq 0.001 \) students' basic psychological needs of Competence, Relatedness and Autonomy; 2) neither teachers nor peer teachers revealed expertise with research-based literacy strategies, or specific cognitive or metacognitive strategies that have been shown to be effective with ELLs learning complex...
academic content, yet ELL students still outperformed the controls; 3) the role of the teacher alters from that of the traditional, teacher-centered classroom to one in which the teacher adopts many roles and responsibilities as she facilitates student learning through tutor-directed experiences. As successful Peer Enhanced Classroom teachers explain, the majority of the work comes before the lesson in creating appropriate group-based learning activities and preparing the tutors to implement these experiences with their students; 4) tutors benefited from the tutoring experiences in many ways. They increased their content knowledge as evidenced by Regents mean score gains over the course of the program. Through interviews, open-ended responses and focus groups, tutors revealed that they had developed a range of interpersonal skills that included better communication, greater comfort in interacting with others, and greater confidence and motivation in their own learning.

Further Questions
We are conducting another field trial during the academic year 2009-2010. We are testing 1) the applicability of the model in different settings and the structural hurdles schools must overcome to implement the model, 2) the extent to which students psychological needs are met, 3) the implications for ELL students, 4) the extent to which the tutoring experience prepares students for college, and 5) the best requirements for selecting tutors.

5. Key insights (retrospective for veteran projects, prospective for newer projects) that have value for the Learning Network:

- Field trials are messy and imperfectly controlled but can be conducted in the urban setting.
- Schools are surprisingly reluctant to restructure even in the face of unambiguous outcomes.
- Student empowerment (sociological) or satisfying student needs (psychological) are robust frameworks in which to study and impact student learning and performance.
- **Peer teaching is a profound, robust mechanism to restructure the way we envision content delivered at the high school.**

References


