Abstract Title Page

**Title:** The BARR program: Impacting Social Emotional Skills and Academic Achievement of 9th grade students in 6 High Schools. Results from a Randomized Controlled Trial.

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**Background:** In recent years, researchers and policy makers have turned their attention to the role of non-cognitive or social and emotional skills in academic success. Numerous studies have demonstrated that students who have higher levels of engagement in school, supportive relationships with teachers, and high expectations of themselves and from their teachers perform significantly better in school and on standardized tests (e.g., Farrington et al, 2012). A student’s positive relationship with an adult at school, for example, is a key factor for fostering positive development, and can lead to higher levels of engagement, motivation, and academic performance (National Research Council, 2004).

Research has demonstrated that positive student-teacher relationships are predictive of academic success (e.g., Crosnoe, Johnson, & Elder, 2004; Gregory et al, 2014; Sabol & Pianta, 2012) and may be even more important for high school students, especially at key transitions such as 9th grade (Roorda, Koomen, Spilt, & Oort, 2011). Student engagement has a more complicated association with academic performance. It is a multifaceted construct that includes behavioral, emotional, and cognitive dimensions, as well as vigor, absorption, and dedication (e.g., Appleton et al, 2006, 2008; Upadyaya & Salmela-Aro, 2013). Researchers have found that the concepts underlying academic engagement can be bidirectional in nature in their association with academic outcomes (Li & Lerner, 2013).

High teacher expectations have long been associated with academic performance (e.g., Akey, 2006; Baker, Terry, Bridger, & Windsor, 1997; Evans, 1997). Teachers can form expectations of whether a student is likely to go to college based on the classes they take (Kelly & Carbonaro, 2012) or their minority status (Lynn, Bacon, Totten, Bridges, & Jennings, 2010; Vega, Moore, & Miranda, 2015).

The combination of supportive relationships and high expectations may be the catalyst for students to try harder, persevere longer, and exceed their own expectations. Building on prior research (Corsello et al, 2015; Borman et al, 2016), the present study, a randomized controlled trial, examines the causal links between intervention, mediating student experiences such as student engagement, and academic outcomes.

**Research Design:** Using a student-level randomized controlled trial, within 6 schools, involving all eligible 9th grade students, this study investigates not only the impact of an intervention on academic outcomes (i.e., core credits earned, and standardized mathematics and reading scores) it also tests the extent to which the intervention impacts students behavioral and socio-emotional skills, and importantly, the extent to which those skills mediate academic outcomes.

**Intervention:** The Building Assets Reducing Risks (BARR) model© targets students in 9th grade, employing a “whole-student” philosophy to education, data-driven problem solving, and risk-review for failing students, while equipping both students and teachers with the skills needed to engage in positive student-teacher relationships.

**Setting/Sample:** Implemented across three states (California, Maine, Minnesota) this study involved 2,172 students comprised from two cohorts of 9th grade students (2014-15 and 2015-16) approximately half of which were randomly assigned to receive BARR supports and half of which experienced “business-as-usual.” Of the students in the sample 71 percent are minority, 8
percent are classified as English language learners, 8 percent are eligible for special education services and 70 percent are eligible for free or reduced price lunch.

**Data Collection and Analysis:** Demographic and outcome data (submitted directly to the research team) included: student’s race/ethnicity, gender, English learner, disability, and free or reduced price lunch status, NWEA MAP reading and mathematics test scores (fall and spring administration), and fall and spring semester credit data for core academic courses.

Student surveys, administered to both treatment and control students, were used to collect measures of student experiences with regard to: expectations and rigor; student engagement; supportive relationships; socio-emotional learning; sense of belonging; and grit.

Impacts for students assigned to receive BARR services relative to those not assigned to BARR were estimated for academic measures (NWEA mathematics and reading scale scores and core credit accumulation), behavioral measures (attendance, discipline referrals), and the six student survey constructs (listed above). Survey data were psychometrically evaluated and fit with the Rasch model yielding interval scale scores for each student, and for each construct. Outcome data were fit with an ordinary least squares, covariate-adjusted, regression models and a series of structural equation models were used to understand the causal relationship between the intervention, student mediating factors, and outcomes. Each model controlled for a student’s starting academic skill level (math or reading assessed via the fall administration of NWEAs), demographic characteristics, included a treatment indicator, and school fixed effects.

**Findings/Results:** Baseline equivalence tests suggest that random assignment yielded groups that were functionally equivalent on observed measures in which there were no statistical differences on pretest or demographic measures between the treatment and control groups. Calculation of overall and differential attrition rates for outcomes measures suggest this study would meet What Works Clearinghouse Standards ([http://ies.ed.gov/ncee/wwc/default.aspx](http://ies.ed.gov/ncee/wwc/default.aspx)) without reservation.

Preliminary results indicate BARR has a positive and statistically significant impact on all three outcomes measures (insert Table 1 here). Analysis of both mathematics and reading NWEA scale scores yielded an effect size of ES=0.08 (p ≤ .05) for mathematics and ES=0.08 (p ≤ .01) for reading achievement. Analysis of core credits earned yielded similar positive, and statistically significant, results with BARR students earning on average 5.3% more credits than control students (ES=.05, p ≤ .001).

Analysis of student survey data demonstrated that BARR has a positive and statistically significant impact on three measures of student experience: expectations and rigor (ES=.23, p ≤ .001), student engagement (ES=.12, p ≤ .05), and supportive relationships (ES=.34, p ≤ .001) (insert table 2).

A full mediation model has not been fit at time of this writing but preliminary results indicate that BARR has a direct effect on all three outcomes, and an indirect effect on outcomes via mediating factors measured by the student survey (e.g., expectations and rigor). A full analysis
will include student scale scores and extant behavioral student data as mediators, and NWEA scale scores and core credits earned as outcomes (see figure 1 for mediation model).
Appendix A. References


Appendix B. Tables and Figures

Table 1. Analytic Results of Academic Outcome Measures

<table>
<thead>
<tr>
<th>Outcome Measures</th>
<th>BARR</th>
<th>Control</th>
<th>Diff</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading NWEA</td>
<td>222.81</td>
<td>221.69</td>
<td>1.13</td>
<td>0.08*</td>
</tr>
<tr>
<td>Mathematics NWEA</td>
<td>231.21</td>
<td>229.74</td>
<td>1.47</td>
<td>0.08**</td>
</tr>
<tr>
<td>Core Credits Earned</td>
<td>84.3%</td>
<td>79.0%</td>
<td>5.3%</td>
<td>0.05***</td>
</tr>
</tbody>
</table>

Notes: statistically significant * = p ≤ .05 level, ** = p ≤ .01 level, *** = p ≤ .001 level.

Table 2. Analytic Results of Student Survey Data

<table>
<thead>
<tr>
<th>Student Survey Scales</th>
<th>BARR</th>
<th>Control</th>
<th>Difference</th>
<th>Effect Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expectations and Rigor</td>
<td>51.21</td>
<td>48.89</td>
<td>2.32***</td>
<td>0.23</td>
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<td>Student Engagement</td>
<td>50.64</td>
<td>49.42</td>
<td>1.22*</td>
<td>0.12</td>
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<tr>
<td>Supportive Relationships</td>
<td>51.75</td>
<td>48.39</td>
<td>3.36***</td>
<td>0.34</td>
</tr>
<tr>
<td>Social and Emotional Learning</td>
<td>50.01</td>
<td>49.99</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>Sense of Belonging</td>
<td>50.23</td>
<td>49.79</td>
<td>0.44</td>
<td>0.04</td>
</tr>
<tr>
<td>Grit</td>
<td>49.81</td>
<td>50.17</td>
<td>-0.36</td>
<td>-0.04</td>
</tr>
</tbody>
</table>

Notes: statistically significant * p ≤ .05, *** p ≤ .001
Figure 1. SEM Model