

## If We Build It, We Will Come: Impacts of a Summer Robotics Program on Regular Year Attendance in Middle School

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### Policy Brief

*Informing  
Policy and  
Practice to  
Benefit  
Baltimore's  
Children*

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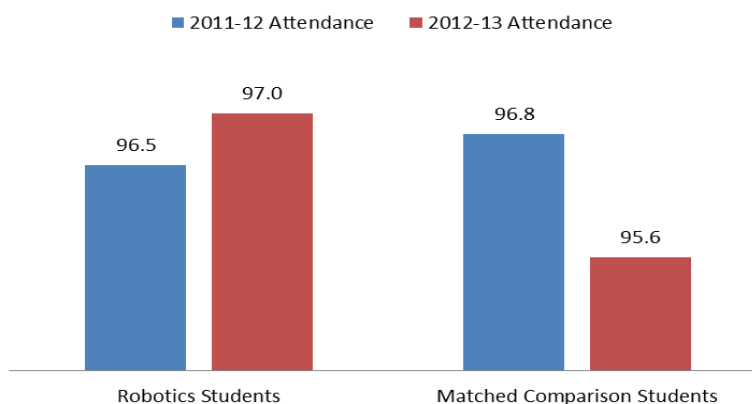
Graduating more students who are college- and career-ready begins with a focus on attendance. Keeping more students engaged in middle school is of critical importance, since attendance often begins dropping off in middle school and leads to the chronic absenteeism and course failure in ninth grade that lower so many students' chances for success in college.<sup>i</sup>

Recognizing the importance of both keeping middle school students engaged and improving their math skills, Baltimore City Public Schools (City Schools) developed a summer school STEM program involving not only math and science instruction but also the experience of building a robot and competing with those robots in a city-wide tournament. Underlying the intervention's logic model was the belief that hands-on activities like robotics can build a sense of competence and value in academic pursuits that will increase student engagement and achievement.

With funding from the U.S. Department of Education (i3) and local foundations, the program has served rising 6<sup>th</sup> to 8<sup>th</sup> graders in sites across the city during the summers of 2012, 2013, and 2014. While the program has fallen short of its enrollment goals and expected summer daily attendance rate, and has not yet had a significant effect on mathematics achievement as measured during the academic year, it appears to have had a significant impact on student engagement.

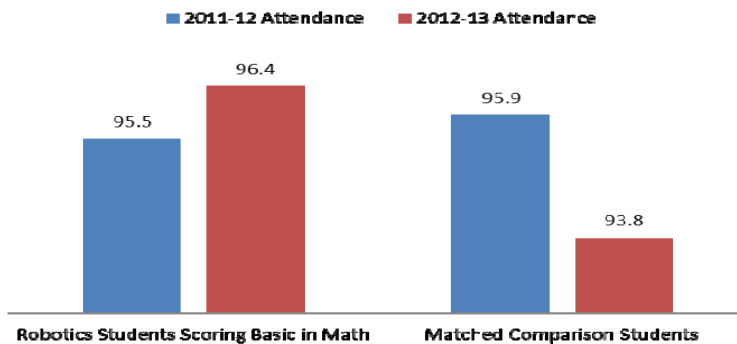
As shown in Figure 1, Summer 2012 robotics students had significantly higher school attendance the year following the program than a comparison group of students matched closely on prior attendance and achievement as well as demographic and school characteristics (but who did not attend summer school).<sup>ii</sup>

Figure 1. Average Attendance Rates During the School Year for Robotics and Matched Comparison Students



This attendance effect was significant and even stronger for the smaller group of students who were low-achieving in mathematics (scored Basic on the prior year's MSA). As Figure 2 indicates, low-achieving program students' attendance increased somewhat, while the matched comparison group students declined in their average attendance rate.

Figure 2. Average Attendance Rates During the School Year for Low-Achieving Robotics Students and Their Matched Comparison Students



It is important to note that the program had a significantly positive attendance effect for males as well as for females. Although the program was designed especially to increase female interest in STEM careers, the majority of its participants in 2012 and 2013 were males (who have lower rates of high school graduation and college enrollment nationally as well as within City Schools). Our informal classroom observations found boys deeply engrossed in building robots. Keeping boys interested in academic pursuits remains a challenge, particularly in high poverty urban contexts. When activities such as robotics engage them actively in building something complex that they can then manipulate and enjoy, they can see tangible results of their efforts, take pride in the competence they have demonstrated, and gain a vision for how what happens in school can be relevant for them both in the present and in the future.

Activities such as robotics may help develop the dispositions of an academic mindset -- particularly the beliefs that ability and competence grow with effort, that "I can succeed at this," and that "this work has value for me."<sup>iii</sup> The results of this study suggest that continued investment in high-interest elective activities such as robotics could have a significant impact on helping students remain engaged in school, who otherwise might begin to disengage and thus lower their chances for successful transition into college and career.

<sup>i</sup>See, for example, E. Allensworth, The use of ninth grade early warning indicators to improve Chicago schools. *Journal of Education for Students Placed at Risk*, January 2013.

<sup>ii</sup>Attendance rates are adjusted statistically for all the demographic, status, achievement, and school characteristics variables included in the analyses. More details are available in a technical manuscript being submitted for publication ("STEMming" the Swell of Absenteeism in Urban Middle Grade Schools: Impacts of a Summer Robotics Program).

<sup>iii</sup>C. Farrington et al., *Teaching adolescents to become learners. The role of noncognitive factors in shaping school performance: A critical literature review*. Chicago, IL: University of Chicago Consortium on Chicago School Research.

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