HR-PAL: Hampton Roads Partnership for Algebra

Abstract

The HR-PAL: HAMPTON ROADS PARTNERSHIP FOR ALGEBRA is led by Hampton University and also includes, as core partners, Paul D. Camp Community College, Thomas Nelson Community College, the Chesapeake School District, the Hampton School District, and the Norfolk School District. This MSP-Start Partnership project is developing the partnership and tools that will culminate in a full Math and Science Partnership proposal with the objective of improving the algebra skills of middle and high school students. The partners will create a framework for understanding where the intersections exist between school-based knowledge and design and engineering literacy, involving applications of mathematics in the real world. The project is focused on narrowing a gap that exists between typical school mathematics problems (involving straightforward procedures and simplified numbers) and the ability to apply appropriate mathematical skills in different contexts.

The project is utilizing data from assessment administrators (from the partnering school districts) to evaluate what is needed to increase student achievement in algebra. The HR-PAL leadership team is addressing all five features of the MSP program through engaging in activities to: 1) strengthen algebra education, 2) help students develop problem solving and critical thinking skills, and 3) motivate students. These activities are expected to allow students to acquire skills that will help them embark on careers in STEM disciplines. Teachers' Circles and Summer Institutes are being held to develop "Algebra-in-Action" projects and discuss plans for implementation of these tools in the algebra curriculum.

An external evaluator will undertake an assessment effort to explore the following research questions:

1) How are the organizations in the partnership capitalizing on the strength of the partnership? (i.e., What change is occurring that would be less effective without the partners?)

2) What contribution does having a formal reciprocal engagement between partners play in enhancing teacher quality?

3) What contribution does having a formal reciprocal engagement between partners play in developing challenging courses and curricula?

4) What is a good design for an MSP Targeted Partnership?

5) What does the needs assessment tell us about the prospects for sustainability?

6) What are the best measures of project effectiveness?

The HR-PAL project is offering a model for minority-serving institutions and engineering and technology programs that have little outreach experience in secondary education. The project and its research findings are reproducible, enabling adoption/adaptation in other areas of the country. The team of a historically black institution of higher learning, two community colleges and three K-12 school districts is identifying the factors that impact successful mathematics achievement from grades 6 through college. The leadership team is also identifying and modeling the factors that make good partnerships work, thus creating a context for producing engineering leaders. The project is producing the following: 1) increased achievement in mathematics and an increased awareness of the inter-relationship between algebra and progress towards a STEM degree (in the K-12 school system); 2) increased enrollment and retention of STEM majors, increased visibility as a leader in STEM undergraduate education for minorities, and increased number of STEM majors who graduate (in the institutions of higher education); and 3) increased numbers of STEM majors entering the workforce and increased economic opportunities (for the community).

	Project Leader	- Akyurtlu, Jale	- Professor, Chem E
	Co-Project Leader	- Pierce, Anne	- Associate Prof., Art
	Project Participant	- Shepard, Eric	- Dean, Engineering
	Project Participant	- Nare, Otsebele	- Assistant Prof. EE
	Project Participant	- Williams, Bryan	- Assistant Prof., Math
	Project Participant	- Henry, Gertrude	- Professor, Education
	Co-Project Leader	- White, Jesse	- Curriculum Leader, Technology
	Project Participant	- Moye, Johnny	- Curriculum Leader, Technology
	Co-Project Leader	- Mun, Ji Hyon	- Assistant Prof. EE
	Co-Project Leader	- Singleton, Maxine	- VP, Instruction
		Van Dyk, Pam	- Evaluator

Other institutions participating include: Norfolk City Schools and Newport News City Schools

Teacher Circle Sample Problem:

An underground tank is to be constructed to store 1000 m3 gasoline in a gas station. It will be a horizontal cylindrical tank with hemispherical ends. It costs \$500/(m^2 of surface area) to construct the cylindrical section, and \$750/(m^2 of surface area) to construct the hemispherical ends. Calculate the tank dimensions for the lowest cost.

Pertinent equations: $V_c = \pi R^2 L$ $S_c = 2\pi RL$

$V_h = 2\pi R^3/3$ $S_h = 2\pi R^2$

Assume: Tank is full.

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