Gender Differences in STEM-Related Self Efficacy Among High School Students Enrolled in Robotics and Other STEM Out-of-School (OST) Time Programs

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Abstract

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by

Sandra Hall

By 2018, there will be more than 8.6 million additional STEM jobs in the United States, with a similar increase in the need for STEM-educated personnel. Policymakers and educators realize that fulfilling this level of demand involves attracting more females. Females are more likely to start postsecondary STEM classes with less self-efficacy than their male counterparts and intervention is needed in secondary school or earlier to prevent these types of gender gaps. Therefore, this proposed study will explore gender differences in STEM-related self-efficacy between OST robotics and other STEM-based OST programs. Survey responses from current high school students participating in OST robotics and other STEM-related OST programs in four high schools will be sought. The independent variables will be type of OST STEM program (robotics and other STEM-related program) and gender. The dependent variable will be the students’ STEM-related self-efficacy. Conclusions drawn from this study may provide useful information to educators, community leaders, parents, and policymakers and serve as a catalyst for conversations about youth OST STEM programs.

*Henry Grady High School*

*Clubs and Organizations for Research*

|  |
| --- |
| ***After School Clubs/Organizations*** |
| ***G3 Robotics*** |
| ***Technology Student Association*** |
| ***DECA*** |
| ***Earth Club*** |
| ***Other Programs***  ***as Recommended*** |

# Recruitment Flyer

**WOULD YOU LIKE TO PARTICIPATE IN A RESEARCH STUDY?**

* Do you participate in **STEM** (Science, Technology, Engineering, Mathematics) in afterschool programs such as Robotics, Science Club, Earth Club, Technology Clubs, or Math Club?
* Are you interested in participating in a research study that will ask you questions about how you feel about STEM courses?\*

*\*Self-efficacy to enroll in STEM courses* is defined as the belief of students in their ability to accomplish specific tasks needed to feel confident to enroll in STEM courses*.*

**TO PARENTS**

* Student participating in this study will be asked to complete a short 15-minute questionnaire how you feel about STEM courses. This research will be conducted at the school, during the time they are in the afterschool STEM program.
* Parents/guardians who agree to allow their child to participate will be asked to sign an informed consent form.
* Students who wish to participate will be asked to sign an assent form.
* There is no payment associated with participation in this study.
* For more information, or to volunteer, please contact Sandra Hall at 404-931-2062 or at sandra.hall@waldenu.edu.

# Assent Form For Research

Hello, my name is Sandra Hall and I am conducting research to learn about the effect STEM afterschool programs have on students’ feelings about STEM courses. I am inviting you to join my research. I am inviting all who are enrolled in STEM afterschool programs including science clubs, robotics, math clubs, and other STEM afterschool programs to be in the study. I am going to read this form with you. I want you to learn about the project before you decide if you want to be in it.

**WHO I AM:** I am Sandra Hall, a student at Walden University. I am working on my doctoral degree.

**ABOUT THE PROJECT:** This study will be to determine how participation in OST robotics programs affects female and male students’ feeling about STEM courses.

If you agree to be in this project, you will be asked to:

* Complete the 15-minute survey on your feelings about STEM courses
* Be honest in your answers

Here are some sample questions:

I am confident that…

* I can complete the math requirements for most STEM majors
* Doing well at math will enhance my career/job opportunities
* A STEM degree will allow me to obtain a well-paying job

**IT’S YOUR CHOICE:** You do not have to participate in this research if you do not want to. If you decide now that you want to participate, you can still change your mind later. If you want to stop, you can.

Participating in the research study might make you tired or stressed, just like a final exam or assessment that you take at school. However, there are no right or wrong answers. But we are hoping this project might help others by understand some key information regarding your confidence in taking STEM classes in high school.

**Payment:** There is no financial payment for participating.

**PRIVACY:** Everything you tell me during this project will be kept private. That means that no one else will know your name or what answers you gave. The only time I have to tell someone is if I learn about something that could hurt you or someone else.

**ASKING QUESTIONS:** You can ask me any questions you want now. If you think of a question later, you or your parents can reach me at sandra.hall@waldenu.edu. If you or your parents would like to ask my university a question, you can call 612-312-1210.

The researcher will give you a copy of this form to keep for your personal records.

Printed name of student

Signature of student Date

Parental Consent Form

Your child is invited to take part in a research study to determine the impact of after school programs on students’ feelings about STEM courses. The researcher is inviting high school students who participate in STEM after school programs to be in the study. This form is part of a process called “informed consent” to allow you to understand this study before deciding whether to allow your child to take part.

This study is being conducted by Sandra Hall, who is a doctoral student at Walden University

**Background Information:** The purpose of this study is to determine the impact STEM afterschool programs have on students’ feelings about STEM courses. If you agree to allow your child to be in this study, your child will be asked to:

* Complete the 15-minute survey
* Be honest in their answers

Here are some sample questions:

I am confident that…

* I can complete the math requirements for most STEM majors
* Doing well at math will enhance my career/job opportunities
* A STEM degree will allow me to obtain a well-paying job

**Voluntary Nature of the Study:** This study is voluntary. You are free to accept or turn down the invitation and, of course, your child’s decision is an important factor. After obtaining parent consent, the researcher will explain the study and let each child decide if they wish to volunteer. No one at the high school will treat you or your child differently if you or your child decides to not be in the study. If you decide to consent now, you or your child can still change your minds later. Your child can stop at any time.

**Risks and Benefits of Being in the Study:** Being in this type of study involves the same risk or minor discomforts your child might encounter in daily life, such as fatigue or boredom with the process. Being in this study would not pose risk to your child’s safety or wellbeing.

The benefits of this study will provide the community with information regarding students’ self-efficacy to enroll in STEM courses. It will provide information that may help understand how educators can encourage more youth to enroll in STEM courses in high school and college.

**Payment:** There is no financial payment for participating.

**Privacy:** Reports coming out of this study will not share the identities of individual participants or their families. Details that might identify participants, such as the location of the study, also will not be shared. The researcher will not use your child’s personal information for any purpose outside of this research project. Data will be kept secure by keeping all records locked in a designated area. Data will be kept for a period of at least 5 years, as required by the university.

The only time the researcher would need to share your child’s name or information would be if the researcher learns about possible harm to your child or someone else.

**Contacts and Questions:** You may ask any questions you have now. If you have questions later, you may contact the researcher via email at sandra.hall@waldu.edu. If you want to talk privately about your child’s rights as a participant, you can call the Research Participant Advocate at my university at 612-312-1210 Walden University’s approval number for this study is **IRB will enter approval number here** and it expires on **IRB will enter expiration date**.

The researcher will give you a copy of this form to keep for your personal records.

**Obtaining Your Consent:** If you feel you understand the study well enough to make a decision about it, please indicate your consent by signing below.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  | | --- | --- | | Printed Name of Parent |  | | Printed Name of Child |  | | Date of consent |  | | Parent’s Signature |  | | Researcher’s Signature |  | |

# Questionnaire

I am interested in knowing how well you believe you could cope with each of the following barriers, or problems, that students could possibly face in pursuing a STEM major in college. Please respond to the following items by indicating your confidence in your ability to cope with, or solve, each of the problem situations, if you were to experience such a situation at the university or college you hope to attend.

***How confident are you that you could...***

**0 1 2 3 4 5 6 7 8 9**

**No Completely**

**confidence confident**

1. Succeed in a math or science course despite having a poor

instructor. 0 1 2 3 4 5 6 7 8 9

1. Balance family responsibilities with the demands of

pursuing a major in a math or science field. 0 1 2 3 4 5 6 7 8 9

1. Find ways to get to know math/science instructors even if

they are busy. 0 1 2 3 4 5 6 7 8 9

1. Find ways to afford things, like software or tutoring, that

you might need to do well in your coursework, even

if your budget is tight. 0 1 2 3 4 5 6 7 8 9

1. Deal with unfair treatment you might receive because

of your gender. 0 1 2 3 4 5 6 7 8 9

1. Cope with a lack of support from professors or

your advisor. 0 1 2 3 4 5 6 7 8 9

1. Persist with these courses even if you did not see many

other people of your culture or racial/ethnic group in them. 0 1 2 3 4 5 6 7 8 9

1. Deal successfully with competition among students

in this field. 0 1 2 3 4 5 6 7 8 9

1. Stick with the decision to take a math/science major even

if someone close to you tried to discourage this decision. 0 1 2 3 4 5 6 7 8 9

1. Complete a degree in math or science despite financial

pressures. 0 1 2 3 4 5 6 7 8 9

1. Find adequate tutoring help in math or science, if you felt

you needed such help. 0 1 2 3 4 5 6 7 8 9

1. Continue taking these courses even if you did not feel

well-liked by your classmates or professors. 0 1 2 3 4 5 6 7 8 9

1. Find ways to overcome communication problems with

professors or teaching assistants in this field. 0 1 2 3 4 5 6 7 8 9

1. Find ways to study effectively for math/science courses

despite having competing demands for your time. 0 1 2 3 4 5 6 7 8 9

1. Continue on in math or science even if you felt that,

socially, the environment in these classes was not

very welcoming for persons of your gender. 0 1 2 3 4 5 6 7 8 9

Turn over the page **→**

***How confident are you that you could...***

**0 1 2 3 4 5 6 7 8 9**

**No Completely**

**confidence confident**

1. Overcome pressure from your family to get out of school

and begin earning money. 0 1 2 3 4 5 6 7 8 9

1. Cope with unfair treatment you might receive because of

your race or ethnicity. 0 1 2 3 4 5 6 7 8 9

1. Balance the pressures of studying for math/science

courses with the desire to have free time for fun

and other activities. 0 1 2 3 4 5 6 7 8 9

In what class are you?

Freshman

Sophomore

Junior

Senior

How many STEM (Science, Technology, Engineering and Mathematics) classes have you taken in high school? \_\_\_\_\_\_\_\_\_\_\_\_

What is your gender?

Female

Male

In what after school program do you participate?

Robotics

Math Club

Science Club

Earth Club

Other \_\_\_\_\_\_\_\_\_\_\_\_

What is your age?

With which ethnicity, do you identify?

African-American

Hispanic

Caucasian

American Indian

Multiracial