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Making PhUn Week a Part of an English Language Learners' Summer Program



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Introduction

EXCELL (Educational Excellence for English Language Learners) is a UNH five-week summer language program that provides English Language instruction and college orientation for Manchester-area middle school and high school students who are Speakers of Other Languages. In 2011, STEM activities including PhUn week were added to EXCELL, and the program is now EXCELL-in-STEM.



Purpose of Adding PhUn

The combined orientation to scientific research and English Language

- Introduces students to challenging and enjoyable scientific projects
- Increases fluency and confidence in English
- Prepares English Language Learners for more challenging courses when they return to their schools
- Enhances scientific career interest among students in under-represented groups.

Adding PhUn prepares English Language Learners for the activities that will follow in the five weeks of EXCELL-in-STEM

Methods

In 2016, there were 27 participating students (17 middle school and 10 high school) in the program. The students took a pre-test and post-test on the course material in English and STEM subjects. Some students also participated in exit interviews with the EXCELL-in-STEM program coordinator to assess learning gains.

Each group met with the physiologist for one session for 1.5 h. The lesson started in the classroom where the physiologist gave a background on the cardiovascular system and the scientific method. She demonstrated blood flow through the heart (on the board and with a squeezable heart). Together the students repeated the contractions of atria and ventricles on their own squeezable hearts .

The students created their hypothesis: *Exercise increases heart rate and blood pressure*. The students were paired and given a worksheet to record their data. To test their hypothesis, they used blood pressure-heart rate monitors to measure their pre-exercise heart rate and blood pressure in the classroom.



Then they moved outside to exercise, and to take post-exercise measurements. An undergraduate volunteer led them in the 5-minute run.



One student of each pair exercised while the other cheered them on.



It was the resting students' responsibility to place the monitor on their partners as soon as exercised ceased. Sometimes they needed help, and the undergraduate volunteers provided the needed assistance.



The data was recorded and the partners switched roles. When the second set of data was collected everyone went back inside the classroom.

Results

Selected students reported their results to the group. After discussion, students agreed that their results supported their hypothesis. Additional information on the benefits of exercise and healthy eating was given by the physiologist.



Middle school students are shown above. Countries represented in both classes were: Bhutan, Burkina Faso, Burundi, the Dominican Republic, the Democratic Republic of Congo, Haiti, Iraq, Malaysia, Morocco, Nepal, Puerto Rico and Sudan.

Results on pre-test and post-test showed significant gains for all participants. The high school students that took both tests (n=7) improved by 3 to 16 points with the average improvement rate of 16%. Middle school students (n= 13) improved by 5-34 points with an average improvement rate of 15.5%.

Exit interviews with 4 high school and 15 middle school students indicated an interest in "learning more about different scientists and what they do". Seven students stated they have aspirations to careers in medicine: 4 pediatricians, 2 nurses, 2 physicians and 1 surgeon.

Included in the group poster titled *Some Things We Learned in EXCELL-in-STEM*:

- The scientific method
- How the circulatory system works
- The steps that blood goes through the heart

Conclusions

Both middle school and high school students recognized the need to study mathematics, biology, and computer science to prepare themselves for college. EXCELL-in-STEM provides them with an opportunity to study on a college campus and interact with college students and professors while performing experiments. To provide more information on careers, in summer 2017, the physiologist will use the PhUn Week career trading cards to describe physiology career opportunities, and will answer student questions.

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