I-ME PROJECT: An interactive mathematics and engineering curriculum amid an established culturally relevant reading literacy program

Marlon Mitchell, PhD. Candidate

University of Illinois-Urbana Champaign

Department of Curriculum & Instruction

Email: mmtchll2@illinois.edu

Abstract

The United States Department of Education has partnered with several agencies to facilitate a cohesive national strategy to resuscitate life into Science Technology Engineering Mathematics (STEM) programs. The strategy has five key areas of interest: P – 12 STEM instruction, increasing and sustaining public and youth engagement with STEM, improving the STEM experience of undergraduate students, better serving groups historically underrepresented in STEM fields, and designing graduate education for tomorrow's STEM workforce. The I-ME project is a STEM related project that is situated in an informal educational setting. The project has the unique potential to address each area of government interest while also reaching students who are from low income families, where low income is determined by the Department of Education's Title I Elementary and Secondary Education Act. The I-ME project also sheds light on the intersection of race and socio economic status. This perspective differs from most STEM related education studies that are comprised of either race/ethnicity and/or gender.

This project's exploratory efforts were designed to actively engage a group of 5th – 8th grade low income African American boys in fundamental mathematics and engineering principles that draw on Ladson-Billings' culturally relevant pedagogy framework[8]. This particular age group is important because during these ages[5], interests are beginning to be formed and choices are being made that will have strong influences on later decisions that include choices of courses in high school, choice of extracurricular activities, and persistence in high school. This research seeks to answer the question: to what extent does an interactive mathematics and engineering curriculum academically motivate a group of low income African American male adolescents? The study is formative and useful to the local Freedom Schools© administration and perhaps other educators who are interested in developing a model that will help increase participation amongst low income African American boys.

Program Description and Context

The Freedom Schools©

The Freedom Schools© is an informal summer enrichment program that is designed using the Children's Defense Fund's Freedom Schools© model. One mission of the Children's Defense Fund's is to pay close attention to children that live in poverty. The Freedom Schools© program follows the model of the historical "Freedom Schools" of the 1964 Civil Rights era. The original freedom schools of the 1960s were designed to empower African Americans in the South, primarily Mississippi, with political awareness and social activism. Today's Freedom Schools© no longer target African American communities exclusively; they include all who are underserved and underrepresented. The program has five key components: high quality academic enrichment, parent and family involvement, civic engagement and social action, intergenerational leadership development, and nutrition, health and mental health. In the summer of 2014 the Freedom Schools© planned to serve more than 12,600 children in 108 cities and 29 states.

The Freedom Schools© program that this study is focused on was established in 2003. This program is supported by a chapter of the state's Regional Office of Education. Each summer the program typically serves 60 to 90 low income predominately African American students and employs 8 to 10 college age trained servant leaders, as they are referred to. A strong emphasis is applied to connecting intergenerational resources, parental involvement, and community engagement that embody the African proverb, "It takes a village to raise a child".

This particular Freedom Schools© met Monday through Friday with students beginning their day at 8 am with a nutritious breakfast. Afterwards, a thirty minute session of "harambee" which means "let's pull together" was performed. The session's components included a Hallelujah chorus, a community reader, a motivational song, cheers & chants, and daily announcements. The purpose of these activities was to jump start the day. All students, staff, parents, and community volunteers in attendance participated. This interaction highlighted the intergenerational element that served as a key component for program success.

The next few hours of the morning session focused on reading literacy. Each classroom was grouped mostly by age, but some occasions ability decided groupings. The groups consisted of five levels: level zero pre-K to kindergarten, level one 1^{st} – 2^{nd} grade, level two 3^{rd} – 5^{th} grade, level three 6^{th} – 8^{th}, and level four 9^{th} – 12^{th} grade. Books were chosen using the Freedom Schools© national curriculum. Books were read aloud and discussed as a group. These books were authored by people of color. The intent of the selections was to present culturally relevant material for self-identity purposes. This self-identification technique is an important component of the Freedom Schools© design because research suggests that texts help construct an "ethos of reception" that speaks to the shaping of one's identity by the recognition, misrecognition, or absence of recognition of the self by others, particularly the dominant culture[12]. Part of the program's literacy goal was to read five books throughout the six week program.

Rounding out the day, was an hour lunch break followed by a rotation of fun activities that consisted of swimming, bowling, arts and crafts, various sports, movies, and field trips.

I-ME Curriculum

Although Freedom Schools© traditionally focus on reading literacy, the intent of the I-ME project was to inject a STEM based curriculum. The I-ME project was generated by collaborated interests of Freedom Schools© program director who wanted to incorporate a STEM component to the yearly summer enrichment program and a University of Illinois graduate whose research interest is studying perceptions and attitudes of African American male adolescents towards mathematics and engineering. Aiming to incorporate mathematics and engineering, an interactive STEM based curriculum was designed that consisted of basic statistics and analysis and beginning concepts of electrical/electronic engineering.

Program timing and budgetary constraints limited the I-ME project to Monday and Thursday afternoons during the third and fourth weeks of the program. An aim of the researcher was to establish an autonomous setting that would situate the researcher as a facilitator rather than a lecturer/teacher. Students met one hour per day totaling four hours of instruction that equaled two 2-day sessions.

Each participant was selected by the program director and staff because of the untapped potential and limited exposure to engineering activities. After working as a mathematics tutor for the program during the two previous school years and observing various program activities throughout the summer, the researcher was able to estimate student mathematics abilities and extract participants' interests. Research indicates the value students place on subject matter or their interest in what they learn is a force that drives intrinsic motivation[11]. During the afternoon sessions of free time, participants oftentimes requested to play basketball and several of the participants actually played organized basketball. Relying on the basketball theme for guidance, the researcher designed the first instructional period using the sport.

There were nine participants in attendance during the first day of instruction, but only eight participated. The first day involved four various agility drills. The drills tested participant's speed, lateral quickness, and jumping ability. The two jumping drills were the standing broad jump and the vertical jump. The speed drill was the shuttle run which had participants run 15 feet to pick up two objects individually that were placed on the ground and return them to the original starting position. The lateral agility drill required participants to back pedal then shuffle sideways around cones, and then sprint forward to the original starting position. The vertical jump and lane agility drills are performed at the National Basketball Association rookie combine. Each participant performed each drill twice and the data was charted in a spreadsheet (**See Tables in appendix**).

On the second day of the instruction students were presented with their data that was measured in time and distance by means of tables and bar graphs. As a group the students discussed the definitions of mean, mode, median, and standard deviation. The use of graphical representation allowed students to more easily compare their individual performances amongst others and themselves. Student interest of the material was noted by recognizing verbal and nonverbal keys during discussions. A series of probing questions were also injected during conversation to gauge students' cognitive outcomes and their ability to connect data usage with engineering practices. For example, students were asked who had the smallest mean time and what the range of scores was.

The second two-day session of instruction included fundamental principles of electrical/electronic engineering using power distribution and Ohm's Law. Students were familiarized with the beginning concepts of energy usage by interacting with an online applet created by the University of Illinois' College of Education's MSTE division. The applet contained real world scenarios of power usage via various types of lighting and household appliances. The applet's objective was to demonstrate energy usage while stimulating discussions about energy efficiency and cost.

The second day of this session involved a hands-on lab that demonstrated the use of multi-meters. The lab also introduced students to various electrical/electronic components such as resistors, thermocouples, batteries, and heating elements (hand held hair dryer). Students were given tasks to measure resistance, voltage, and current. Later Ohm's Law was explained and students took measurements with the multi-meter that compared results calculated by Ohm's Law with actual measurements. The goal was to demonstrate how electrical components influenced power usage and show the connection between mathematics and electrical/electronic engineering design.

Methods

Participants

All participants were from four public schools that were located in the same school district. The schools represented were two middle schools (6^{th} -8^{th} grades) and two elementary schools (K – 5^{th} grades). All participants were African American males that were between the ages 10 – 13. There were two 5^{th} graders, one 6^{th} grader, five 7^{th} graders, and three 8^{th} graders. Attendance slightly fluctuated throughout the study. The project's curriculum facilitator had a Masters of Education degree from the University of Illinois' Curriculum and Instruction department, a bachelor's degrees in Computer Science and Industrial Engineering Technology, and workforce experience in STEM related fields that covers a decade. There were two classroom assistants. One assistant had a bachelor's degree in History and the other assistant had a bachelor's degree in Communications.

Instruments & Design

The instruments used were pre and post surveys along with a focus group exit interview. Each instrument was reviewed by the University of Illinois Urbana Champaign's Institutional Review Board. Both surveys consisted of Likert scale design, and each response was broken into four categories; strongly disagree, somewhat disagree, somewhat agree, and strongly agree. The pre-survey was distributed to eight participants during the first day of instruction. There were six questions that measured attitudes in regards to mathematics. The post-survey and exit interview were both administered during a meeting that took place one week after the summer program had concluded. There were two participants that attended the meeting, completed the post-survey, and participated in the exit interview. The post survey also included six questions that measured attitude towards mathematics. The exit interview was conducted using a semi-structured format that was audio recorded. It consisted of seven scripted questions that were supported by ancillary probing questions. The interview lasted approximately fifteen minutes and the audience included the interviewer, two interviewees, and a note taker.

Literature Review of Theoretical Frameworks

The overlap between race/ethnicity and socio-economic status limits reliance on previous literature because there has been little research that involves this study's particular population. In an attempt to answer the research question, to what extent does an interactive mathematics and engineering curriculum motivate a group of low income African American male adolescents, it is hypothesized that the lack of relevant instruction and availability to STEM programs has had negative impacts on motivation, thus limiting participation. This study hinges on Carol Dweck's Motivational Process and Gloria Ladson-Billings' Culturally Relevant Pedagogy framework to better understand the conceptualized hypothesis.

Motivational Process Model

Dweck's[3] motivational process model aids the understanding that motivation deals with goal oriented activities. These goals are broken into two classes: learning goals and performance goals. Dweck suggested that learning goals present themselves when an individual is seeking to increase their competence (ability) to understand or master something new. In comparison, she further suggested that performance goals are goals in which an individual seeks to gain favorable judgment of their competence or avoid negative judgment of their competence[4]. Dweck divides each class of goals into two patterns: adaptive and maladaptive. Adaptive patterns are those motivational patterns that promote the establishment, maintenance, and attainment of personally challenging and personally achieving goals while maladaptive patterns are those motivational patterns that are associated with failure to establish reasonable, valued goals, to maintain effective striving towards those goals, or, ultimately obtaining those goals that are potentially within one's reach[3]. Adaptive patterns find children enjoying exerted efforts in task mastery while maladaptive patterns find children avoiding challenges and lacking persistence in the face of difficulty. Another way in which Dweck defines these patterns are incremental and identity. The incremental pattern is the belief that intelligence can be built up and the identity pattern is the belief that intelligence is fixed. In summation, Dweck's research found that goal orientations differ in regards to the two aforementioned motivation patterns. Goals, quite naturally, should define clear concise outcomes. However, Dweck found that *failures* to reach desired outcomes have different meanings between the two frameworks. For the entity-theory framework, failure is interpreted as possessing low intelligence while in the incremental-theory framework failure is a cue to try something new[2].

Culturally Relevant Pedagogy

Gloria Ladson-Billings has conducted research to inform educators of culturally relevant pedagogy. Her work focuses on student learning and academic achievement versus classroom and behavior management, cultural competence versus cultural assimilation or eradication, and sociopolitical consciousness rather than school-based tasks that have no beyond-school application [7]. In her work she has been able to witness students taking both responsibility for and deep interest in their education. The ability to link principles of learning with deep understanding of (and appreciation for) culture is the essence behind culturally relevant pedagogy. Like Ladson-Billings[7], Danielle Hickey[6] found that contextual and cultural factors are paramount in the operation of cognition and motivation, although the term Hickey used was socio-constructivist instruction.

Ladson-Billings' Culturally Relevant Pedagogy is a pedagogy that promotes the kind of student success that engages larger social structural issues in a critical way. The lack of underrepresented and underserved students in STEM is a larger social structural issue. The federal government understands the dilemma and it recognizes that if the issue is not addressed, the competitive edge that the United States holds will be jeopardized; especially since a considerable portion of the United States will be persons of color by 2050.

Findings

Field Day Activities

Referencing Dweck's motivational theory, the I-ME project findings showed that the statistical field day activity was oriented towards performance goals[3]. Prior to any field day activities, students were asked a series of questions that probed their knowledge of the NBA rookie combine. The students had no knowledge of what the combine was or how it operated. It was explained to the students how basketball athletes partook in various drills that showcased their athletic abilities while coaches observed during rookie combine events. These unseen and previously unexplained activities of the NBA rookie combine grabbed student interest which led to students creating performance goals through internal and external motivation. Students challenged themselves and one another throughout the activities. Competitions became so heightened that students requested additional attempts to improve scores despite the ninety degree temperatures. Dweck categorized such behavior as adaptive patterns which are motivational patterns that promote personally challenging and personally achieving goals.

The following day of instruction students met in a classroom setting to analyze and discuss the collected data. Students were questioned about prior knowledge of descriptive statistics, tables, and graphs before being shown the results of the field activities. Most of the students had knowledge of mean, mode, median, tables, and various types of graphs and charts. One student even commented, "Why are we doing something so easy?" Once shown, students engaged in conversations that centered around who outperformed whom. The relevance of the activity was explained by contextualizing how NBA coaches used similar techniques in data acquisition to make informed decisions as to whom they would consider drafting (choosing) for their respective team. It was also explained that engineering fields commonly use these techniques to design and improve cars, machines, equipment, processes, etc. The objective of the exercise was to help students make a connection between mathematics and fundamental engineering concepts using enjoyable culturally relevant pedagogy. The culturally relevant pedagogical approach seemed to make a difference with understanding the usage of statistics and how it related to engineering. During the exit interview when asked about the advantages of statistics, one participant responded, "it helps you think like an engineer".

Electrical/Electronic Activities

Dweck and Elliot's methods of learning goals were explored using the fundamental electrical engineering concepts that involved a virtual demonstration of power distribution, electronic component measurements, and mathematical concepts connecting to Ohm's Law[4]. Participants had no prior knowledge of power distribution, measuring electronic components, or Ohm's Law. Introduced first was the interactive computer based applet that demonstrated power distribution and energy consumption. The lesson began by probing students about their knowledge of home appliances and power consumption. Even though students were familiar with the appliances, they had no knowledge of power consumption. The applet allowed students to choose a series of appliances from dropdown menus that simulated an appliance layout of a home. For example, the layout would have dropdown menus for various lighting, oven/ranges, washer/dryer, hair dryers, etc. arrangements. Once students selected the setup that they thought would use either the most or least power consumption, the applet would calculate and display the total power consumption along with cost. The applet also trended power consumption results graphically which served as a visual aid. During the demonstration students raised questions about electrocution. For example one student asked, "Why don't birds get electrocuted when sitting on electrical wires?" Another student asked about the dangers of residential outlets. And other students commented on electrocution depicted in movies. By explaining the functions of insulation in electrical safety and how varying levels of voltage operated, student's questions were answered. The questions showcased Dweck's incremental theory. However, student attitudes and curiosities changed during the explanation of calculating power consumption using Ohm's Law (**See Appendix**). The exercise involved manipulating the equation (algebra) to find missing variables. When presented with this task, students appeared to become disengaged. A hands-on lab was introduced to assist students with understanding the mathematical concepts. The lab directed students to measure resistors, voltages, and current using multi-meters. Students' questions mostly centered on the operation of the multi-meter and not the lab exercise itself. Students' attention span dwindled and they began to fidget with the electronic components rather than perform the actual lab. It was inferred that student behaviors were created by the algebraic concepts given in the exercise. All the students had prior exposure to pre-algebra/algebra in their traditional mathematics classrooms. This particular part of the study found that students were unable to connect theory and practice; in fact each student became disengaged with the hands-on. Dweck ‘s motivational theory defined this type of reaction as maladaptive patterns.

DISCUSSION

The I-ME project was designed to explore motivation of a group of low income African American boys in regards to STEM related activities (in particular mathematics and engineering) and to guage the affects of culturally relative instruction. By no means does this research suggest in order for African American boys to learn they need be exposed to or relegated to basketball or any other sport for that matter.

For more than a decade, anthropologists have examined ways that teaching can better match the home and community cultures of students of color[8]. This research merely elucidates the importance of curriculums that explore marginalized students’ motivations and how those motivations are transferable to the active learning process. I believe that motivation was increased because of the familiarity and enjoyment of the sport of basketball in which the field events were designed. Eight of the ten participants were involved in organized basketball so that exposure to the sport intensified the interest in the field activities. Once the student interest was captured, motivations became heightened and students became eager to learn the statistical material. Ryan & Deci’s[1] research explained that knowing how to promote more active and volitional (versus passive and controlling) forms of extrinsic motivation becomes an essential strategy for successful teaching.

The Ohm’s law material didn’t transfer over as well as the statistical field day material. When presented with the Ohm’s Law and electronic component measurement, students were noticeably less enthusiastic about the material. Even though most of the group had been exposed to manipulations of equations (pre-algebra), challenges were quite evident. Instructions were repeatedly explained but students continuously found it difficult to apply key mathematical concepts. According to Milgram and Wu[9] many [middle school] students experience gaps in their understanding of various topics, such as fractions and proportional reasoning, so success in algebra is often described as being greatly dependent on a student’s knowledge of the properties and operations with whole numbers, fractions, and decimals. Understanding this, the study infers that students struggled with the Ohm’s Law and electronic component measurement part of the study because isolating variables requires proficient algebra skills that the students had not mastered yet.

Although the research identified students not grasping mathematical concepts they had been previously exposed to in traditional coursework, it is important to note not to confuse learning goals with the level of intellect, as Dweck explained[2]. She also stated that there is no direct relationship between learning goals and intellect which are important because this particular part of the curriculum should serve as a point to build cognitive skills in the content area of whole numbers, fractions, and decimals using a culturally relevant curriculum.

Conclusion

Although the federal government has set aside millions of dollars and spearheaded a national push for STEM education, there still remain opportunities for STEM programming within the underrepresented and underserved communities. For instance, one of the most familiar national programs that is designed to introduce, teach, and assess cognitive skills of students in STEM is First Lego League Robotics. Sadly, this particular program, and others alike, typically reach populations that are of the dominant class and/or affluent. The promotion and awareness of STEM programs are important, but culturally relative curriculum design and financial support of underrepresented and underserved youth are key foundational components as well.

So, why is the I-ME project important? Lent, Brown, & Hacket (1994) found that interests and skills developed during school years ideally become translated into career selections – although social and economic factors frequently intervene to affect the level and content of choices pursued. Various studies have firmly identified a need to involve more underrepresented underserved populations in STEM scholarship and professions. The local school district in which this study took place has a significant enrollment of low-income and underrepresented students so much so that the district has been identified as a majority-minority district (minorities consisting of the majority of the population). Given this backdrop, there is abundant opportunity to reach a population that has been historically underrepresented in STEM fields.

So where is this national STEM commitment heading? Linda Darling-Hamilton argued that one deficiency of the US education system is that it relies too heavily upon project based models and ideas that fail to address systemic issues, such as equity and access. (AERA Conference, 2012). Perhaps Villegas[13] was on to something when her work suggested that the source of cultural mismatch is located in larger social structures. She also asserted that schools as institutions serve to reproduce social inequalities. Villegas states as long as schools perform sorting functions in society, that necessarily produce winners and losers, culturally sensitive remedies to educational problems of oppressed minority students that ignore the political aspect of schooling are doomed to failure. Together these two contentions collectively provide insight into why there are so few underrepresented underserved participants in STEM fields, meaning the issue is a social issue and not just an issue in STEM education.

So does this mean that projects such as I-ME have little importance and won't yield any fruits? I strongly disagree with that notion because efforts like I-ME are important to add to the conversation as to what is needed to reach underrepresented and underserved populations. So where do the fruits of projects such as I-ME and how relevant are they? To date, there is limited STEM education research on the effects of class and race/ethnicity in early introduction/exposure and motivation of African American boys. Studies like the I-ME project provides researchers, practitioners, policy makers, and support groups with important insight to further explore and build upon. It also identifies gaps in other STEM initiatives that have failed to address participation or inclusion of underrepresented and underserved populations. Without studies like the I-ME project, current federal government led STEM initiatives will continuously miss the mark.

Bibliography

[1] Deci, E., Ryan, R. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25.

[2] Dweck, C., (2002). Messages that motivate: How praise molds student beliefs, motivation, and performance (in surprising ways). *The Journal for Academic Achievement*.

[3] Dweck, C., (1986). Motivational process affecting learning. *American Psychologist* 41(10).

[4] Dweck, C., & Elliott, E., (1983). Achievement motivation. In P. Mussen & E. M. Hetherington (Eds.), Handbook of child psychology (pp. 643–691). New York: Wiley.

[5] Fouad, N., Smith, P. (1996). A test of a social cognitive model for middle school students: Math and science. *American Psychological Association*, 43(3).

[6] Hickey, D. (1997). Motivation and contemporary socio-constructivist instructional perspectives. *Educational Psychologist*, 32.

[7] Ladson-Billings, G. (2014). Culturally relevant pedagogy 2.0: aka the remix. *Harvard Educational Review*, 84(1).

[8] Ladson-Billings, G. (1995). Toward a theory of relevant pedagogy. *American Education Research Journal*, 32(3).

[9] Milgram, R. J., & Wu, H-H. (2005). The key topics in a successful math curriculum. Retrieved from http://math.berkeley.edu/~wu/six-topics1.pdf.

[10] Pintrich, P. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology*, 95(4).

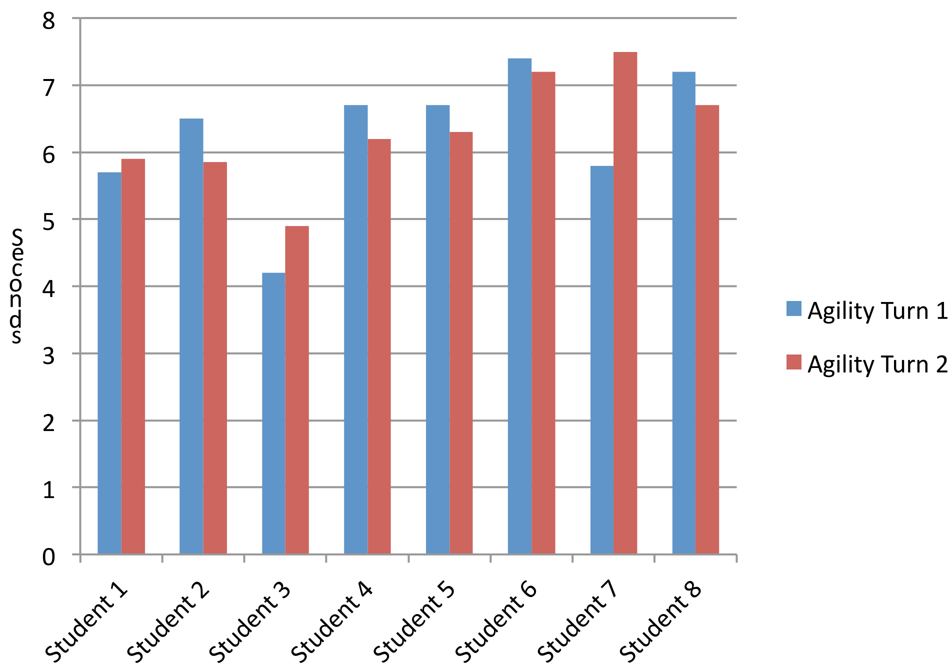
[11] Schiefele, U., Csikszentmihalyi, M. (1995). Motivation and ability as factors in mathematics Experience and Achievement. *Journal for Research in Mathematics Education*, 26(2).

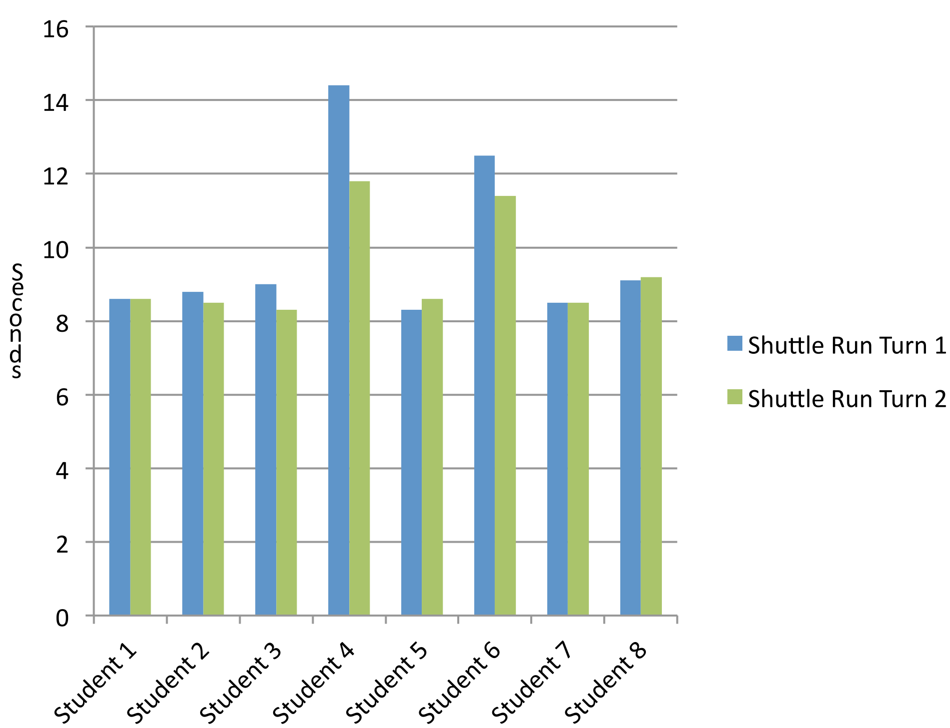
[12] Suarez-Orozco, C., Suarez-Orozco, M. (2001). *Children of Immigration*. Cambridge, MA: Harvard University Press.

[13] Villegas, A. (1988). School failure and cultural mismatch: Another view. *The Urban Review*, 20(4).

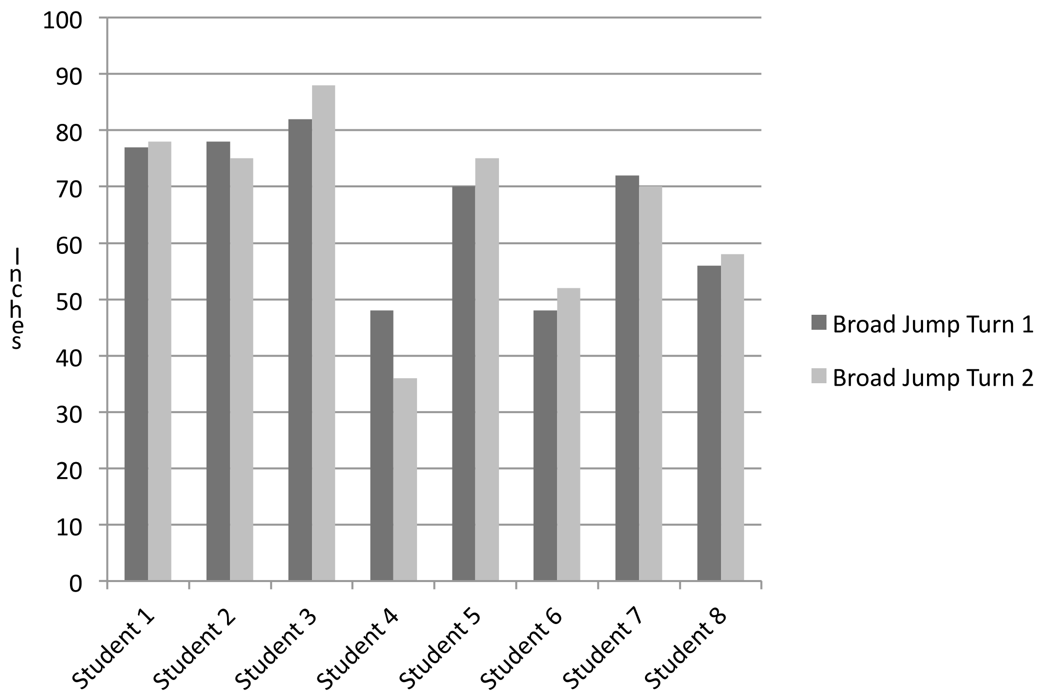
APPENDIX

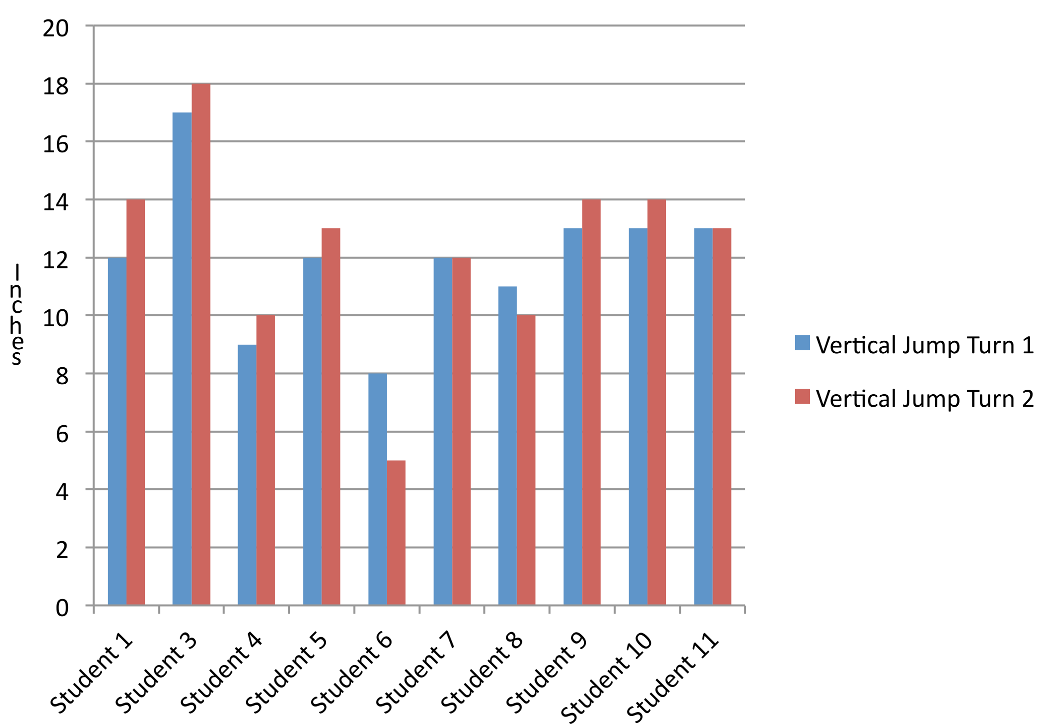
STUDENT DATA GRAPHS





STUDENT DATA GRAPHS





STUDENT DATA TABLES

	Agility	
	Turn 1 (sec)	Turn 2 (sec)
Student 1	5.7	5.9
Student 2	6.5	5.85
Student 3	4.2	4.9
Student 4	6.7	6.2
Student 5	6.7	6.3
Student 6	7.4	7.2
Student 7	5.8	7.5
Student 8	7.2	6.7

	Shuttle Run	
	Turn 1 (sec)	Turn 2 (sec)
Student 1	8.6	8.6
Student 2	8.8	8.5
Student 3	9	8.3
Student 4	14.4	11.8
Student 5	8.3	8.6
Student 6	12.5	11.4
Student 7	8.5	8.5
Student 8	9.1	9.2

	Broad Jump	
	Turn 1 (in)	Turn 2 (in)
Student 1	77	78
Student 2	78	75
Student 3	82	88
Student 4	48	36
Student 5	70	75
Student 6	48	52
Student 7	72	70
Student 8	56	58

STUDENT DATA TABLES

	Vertical Jump	
	Turn 1 (in)	Turn 2 (in)
Student 1	12	14
Student 3	17	18
Student 4	9	10
Student 5	12	13
Student 6	8	5
Student 7	12	12
Student 8	11	10
Student 9	13	14
Student 10	13	14
Student 11	13	13

Ohm's Law:

Voltage = Current * Resistance (V = IR)

Power = Current * Voltage (P = IV)

Student Pre-Survey

Grade Level________________

School Attended___________________

Please mark the box that best answers the question

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
I look forward to math class.	☐	☐	☐	☐
I enjoy working in groups in math class.	☐	☐	☐	☐
I like hands-on activities in math class.	☐	☐	☐	☐
Math is my favorite subject in school.	☐	☐	☐	☐
I am interested in learning how math helps design things.	☐	☐	☐	☐
I find math useful in different activities.	☐	☐	☐	☐

Student Post-Survey

Grade Level________________

School Attended___________________

Please mark the box that best answers the question.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
The I-ME program has helped me understand math better.	☐	☐	☐	☐
I plan to use the math skills I learned in I-ME in math class.	☐	☐	☐	☐
The hands-on activities helped me understand math better.	☐	☐	☐	☐
I feel more confident about my math skills since I attended I-ME.	☐	☐	☐	☐
I am interested in learning more about how math helps design things.	☐	☐	☐	☐
I find math useful in other subjects.	☐	☐	☐	☐

Student Interview Questions

1. Had you ever heard of the term STEM education? If so, where?

2. What does engineering mean to you?

3. Tell me about your favorite project in the I- ME program?

4. Tell me about your least favorite project in the I- ME program?