ADVANCED MANUFACTURING AND PROTOTYPING, INTEGRATED TO UNLOCK POTENTIAL (AMP-IT-UP)

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AMP-IT-UP LEADERSHIP

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AMP-IT-UP

- A National Science Foundation Math and Science Partnership to promote workforce development and cultivate the next generation of creative STEM innovators.

- Partnership with the Griffin Spalding County School System
  - 2 High Schools, 4 Middle Schools
  - Professional Development for over 50 teachers

- Impact: > 11,000 students over 5 years
PROGRAM COMPONENTS

• Middle school STEM Innovation and Design (STEM-ID) exploratory courses that enable students to explore their creativity using robotics and rapid prototyping

• Middle school math and science modules that promote inquiry and 3 dimensional learning

• Research on how AMP-IT-UP affects academic engagement, content understanding, knowledge transfer and student persistence in STEM
• 18-week STEM-ID course for 6th - 8th grades

• Theoretical Framework:
  • Utilizing the Engineering Design Process (EDP) within a problem-based learning (PBL) context
AMP-IT-UP INTEGRATED THEMES

1. Experimental Design
   • Planning and Carrying Out Investigations (NGSS Practice 3)
   • Make Sense of Problems (SMP #1); Use Appropriate Tools Strategically (SMP #5)

2. Data Visualization
   • Analyzing and Interpreting Data (NGSS Practice 4)
   • Make Sense of Problems (SMP #1); Model with Mathematics (SMP #4)

3. Data Driven Decision Making
   • Constructing Explanations and Designing Solutions (NGSS Practice 6)
   • Engaging in Argument from Evidence (NGSS Practice 7)
   • Make Sense of Problems (SMP #1); Construct Viable Arguments (SMP #3)
Middle School Connection/Exploratory Engineering and Technology Course

Courses are divided into 4 challenges which build different skills:

1. Data Challenge
2. Systems Challenge
3. Visualization Challenge
4. Design Challenge
   
   6th - Carnival Tycoon
   7th – Flight of Fancy
   8th – Robot Rescue
# STEM-ID 6th Grade Course Structure & Skills Addressed

### 6th Grade STEM-ID Course- Carnival Tycoon

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Engineering and Problem Solving</th>
<th>Cross-Disciplinary Skills</th>
<th>Science and Math Practices</th>
<th>Foundational Math</th>
<th>Communication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Data Challenge</strong></td>
<td>Decision-making using data</td>
<td>Data Collection &amp; Analysis</td>
<td>Analyzing &amp; Interpreting Data Engaging in Argument from Evidence</td>
<td>Fractions, Arithmetic, Calculating Profit</td>
<td>Sales Pitch</td>
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<tr>
<td><strong>Systems Challenge</strong></td>
<td>Engineering Design Process</td>
<td>Probability Validation</td>
<td>Analyzing &amp; Interpreting Data</td>
<td>Probability, Profit</td>
<td>Presentation of a Design</td>
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<tr>
<td><strong>Visualization Challenge</strong></td>
<td>3D Drawing</td>
<td>Spatial Reasoning</td>
<td>Developing &amp; Using Models</td>
<td>Geometry, Surface Area, Volume, Rotation</td>
<td>Using visuals and drawings to convey an idea</td>
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<tr>
<td><strong>Design Challenge</strong></td>
<td>All of the above</td>
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AMP-IT-UP STUDENT IMPACT:

Mixed-methods research design to investigate STEM-ID impact:

- STEM-ID participation on Math and Science state-level assessments
  Georgia Milestones Assessment System
- STEM-ID participation on Student Perception and Efficacy
  Student surveys

AMP-IT-UP STUDENT IMPACT:

Georgia Milestones Assessment System

- Administered statewide in grades 3 through 8
- Criterion-referenced test, also includes norm-referenced items
- Student results are provided as Achievement Levels and Scale Scores
  - \textit{Beginning Learner, Developing Learner, Proficient Learner, Distinguished Learner}
  - \textit{Scale scores range from 140-830}

Student Surveys

- Survey instrument consists of 51 Likert-type self-report items
  - Response options range from Strongly Disagree to Strongly Agree
- Construct Categories:
  - Engagement, Self-efficacy, Interest, Anxiety

AMP-IT-UP STUDENT IMPACT:

Average Math and Science Milestones Scores per Engineering Course Attendance-Level Group

Students who attended multiple years of the course had:

• Higher rates of science interest*
• Higher rates of behavioral and cognitive engagement*
• Higher rates of academic self-efficacy
• Lower rates of science and math anxiety
• Higher average ratings of engagement in technology and science

This table should include simple images and/or descriptions of any design concepts brainstormed by you and your team. At least 3 independent concepts should be brainstormed prior to your first evaluation. More concepts can be added as you iterate. New concepts might include elements from two of your original concepts, in which case you might add concept 'AB' (containing a blend of features from Concept A and Concept B). Alternatively, you might make minor modifications to an original concept, which might become 'A1', for example. A totally new concept should get its own letter.

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<tr>
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QUESTIONS?

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