

Instructional Design, Development and Evaluation

Techniques in Educational Evaluation

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LOGIC MODEL

The Immersive Learning: Gamified Self-Regulation in Math with Learning Analytics project aims to enhance middle school students' engagement and achievement in mathematics through a mobile prototype that integrates gamification and learning analytics. The instructional materials consist of a gamified mobile application designed to improve students' self-regulation skills while learning key mathematical concepts, such as expressions, equations, and ratios. This initiative targets underserved students from low-income backgrounds, particularly in Syracuse's middle school classrooms, where poverty has been shown to hinder academic achievement in math. The goal is to help students overcome learning barriers through immersive, interactive learning experiences that promote self-regulation and mathematical reasoning. The materials are designed to align with New York State's Next Generation Mathematics Standards. **Objectives** include fostering engagement, improving self-regulation, and enhancing math achievement through a combination of in-app problem-solving tasks and teacher-supported interventions.

Program Goal 1: Enhance underserved middle school students' math engagement and achievement through immersive learning experiences supported by learning analytics.

1. Objective 1: Integrate gamification concepts into math learning activities on a mobile application to foster self-regulation skills in students.
2. Objective 2: Utilize learning analytics to monitor students' progress in mathematics goals, analyze problem-solving patterns, and identify areas for targeted improvement.

Program Goal 2: Enhance low-income children's self-regulation to help them be more successful in mathematics classrooms.

1. Objective 1: Offer low-income students' opportunities and resources by providing access to a mobile app to enhance their skills in mathematics.
2. Objective 2: After using the math learning prototype app, students will demonstrate improved engagement, motivation, and sustained attention in mathematics learning.

Program Goal 3: Develop and disseminate a model for using gamified self-regulation in math classrooms to enhance learning in underserved populations.

1. Objective 1: Gather and analyze data on student performance to inform in creating teacher-supported self-regulation interventions.
2. Objective 2: Share findings and resources with educators to inform broader use of gamified self-regulation tools in mathematical educational settings.

| Resources | Activities | Outputs | Short-Term Outcomes (Yrs. 1-2) | Long-Term Outcomes (Yrs. 3-5) | Impacts (After 5 Yrs.) |
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| <ul style="list-style-type: none"> ● Project manager ● PI and co-PIs ● Student researchers ● Programming expert ● Mobile game development software ● Classroom teachers ● Hire four researchers with expertise in self-regulation, cognition, and math respectively ● Funding ● Cooperation from school district ● Access to statistics software | <ul style="list-style-type: none"> ● Host focus groups for developing self-regulatory content (two separate groups). ● Host focus groups for reviewing and critiquing self-regulatory content (two separate groups). ● Develop mock-up learning prototype and usability test. ● develop a learning prototype (final) and usability test. ● Implement the learning app for | <ul style="list-style-type: none"> ● Mobile app that gamifies self-regulation in the context of mathematics. ● During development 10 middle grade mathematics teachers will be consulted via focus group. ● Teacher from Solvay district participated in a pilot testing mobile app prototype. ● 20 middle grade students and their | <ul style="list-style-type: none"> ● PI and co-PIs will expand their capacities in their respective fields. ● Student researchers develop new skills in data collection and analysis to the PI and Co-PIs satisfaction, by project completion. ● Increase the teachers' knowledge of how to support students' self-regulating behavior (improvement of 25% from pretest to post test). | <ul style="list-style-type: none"> ● Students who participated experienced success (A-B grade average) in future mathematics courses. ● Students who participated experience long-term improved self regulation skills allowing for completion of k-12 education. | <ul style="list-style-type: none"> ● Students who participated will be admitted to higher education ● Students who participated will graduate from higher education. ● Students who have participated in the program will succeed in higher education STEM related fields. |

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| <ul style="list-style-type: none"> ● Pilot users (students/teachers) ● Cooperation of pilot users guardians (student parents) ● Pre and Post tests measuring teacher and student outcomes/progress | <p>data collection in classrooms.</p> <ul style="list-style-type: none"> ● Analyze/code qualitative and quantitative learning app data. ● Identify 4-5 learning themes. ● Pre and post tests for measurement of teacher outcomes. ● Pre and post tests for measurement of student self regulation outcomes. ● Pre and post tests for measurement of student mathematics outcomes. | <p>teachers participate in app pilot testing.</p> <ul style="list-style-type: none"> ● Collected data will be analyzed and coded by four researchers with expertise in self-regulation, cognition, and math to identify themes. | <ul style="list-style-type: none"> ● Increase teachers' knowledge/confidence in supporting their students' learning and performance in mathematics (improvement of 25% from pretest to post test). ● Middle grade students demonstrate improved self-regulation skills (increased attention spans, task focus and engagement, critical thinking skills, and motivation) via improvement of 25% from pretest to post test. ● Middle grade students demonstrate improved mathematics skills (improvement of 25% from pretest to post test) | | |
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| Assumptions | External Factors |
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| <ul style="list-style-type: none"> ● Students guardians will allow them to participate in pilot testing ● App prototype will improve student self regulation skills and mathematics achievement outcomes. ● App will improve teachers' ability to support students with academic self regulation, and their mathematics improvement. ● Teachers will be willing to integrate new technology into their classrooms. ● Teachers will be willing to participate in focus groups and pilot testing. | <ul style="list-style-type: none"> ● Teacher participation ● Student participation ● Schools IT capabilities ● Scheduling conflicts among focus group and pilot testing participants. ● Students ability to access technological components ● Student's prior knowledge and experiences with technology. |