

Enhancing CS1 Engagement and Outcomes with Amplify-Supported POGIL Activities *

Workshop

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Workshop Description

The introductory programming course—commonly referred to as CS1—is well known for its difficulty and high failure rates. Over the years, numerous instructional strategies have been proposed and researched to improve learning outcomes in CS1. One such approach is **Process Oriented Guided Inquiry Learning (POGIL)** [3, 6].

At our institution, some faculty have modified the document based POGIL activities originally developed by Hu et. al [3], and have adopted them for several years. In this model, students work collaboratively in structured teams to explore a sequence of carefully crafted scenarios and questions, constructing their own understanding of new programming concepts. Since its inception, research has shown that POGIL leads to decreased failure and withdrawal rates and increased numbers of A's and B's [1, 2, 4] in courses in different disciplines.

However, we encountered several practical challenges that emerged with this traditional implementation in CS1 coursework. The activities were time-intensive for students to complete during scheduled class periods. In addition, team management for the instructor could be difficult, particularly in addressing disengaged and online students. Third, instructors often struggle to monitor team progress for timely intervention.

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To address these issues, a group of faculty in our institution collaborated in Summer 2024 to redesign our POGIL activities using the **Amplify** platform [5]. Amplify is a free, web-based tool that supports the creation of interactive, slide-based lessons. It offers powerful classroom management features that allow instructors to track student and team progress in real time, quickly identify misconceptions, and provide immediate feedback—resulting in a more adaptive and efficient learning experience.

We piloted Amplify-supported POGIL activities in multiple CS1 sections during Fall 2024 and Spring 2025, involving five instructors teaching both control and treatment groups across in-person and online formats. Pre- and post-survey results will be presented at the workshop. Although response rates vary, preliminary high-level findings indicate strong positive sentiment:

- Amplify Learning: 45% rated the experience as more than moderately effective; 17% rated it less than moderately effective.
- Amplify Motivation: 44% found it more than moderately effective; 25% rated it less than moderately effective.
- Amplify Peer Interaction: 54% rated it more than moderately effective; 23% rated it less than moderately effective.

These early results suggest the effectiveness of Amplify-supported POGIL activities in promoting both student learning and motivation.

Workshop Agenda(90 minutes)

- Introduction to the POGIL Instructional Model (15 min)
- Overview of Amplify as a Delivery Platform for POGIL (15 min)
- Hands-on Creation of Amplify-Based POGIL Activities for CS1 (45 min)
- Demonstration of Features for Monitoring and Supporting Student Engagement in Amplify (15 min)

Access to a curated subset of Amplify-integrated POGIL activities will be provided to participants. Contact information will be collected at the workshop to facilitate distribution upon successful completion of the two-year project.

References

- [1] Catherine Bénéteau, Gordon Fox, Xiaoying Xu, Jennifer E Lewis, Kande-thody Ramachandran, Scott Campbell, and John Holcomb. Peer-led guided

inquiry in calculus at the university of south florida. *Journal of STEM Education: Innovations and Research*, 17(2):5, 2016.

- [2] John J Farrell, Richard S Moog, and James N Spencer. A guided-inquiry general chemistry course. *Journal of chemical education*, 76(4):570, 1999.
- [3] Helen H Hu and Tricia D Shepherd. Teaching cs 1 with pogil activities and roles. In *Proceedings of the 45th ACM technical symposium on Computer science education*, pages 127–132, 2014.
- [4] Suzanne M Ruder and Sally S Hunnicutt. Pogil in chemistry courses at a large urban university: A case study. In *Process Oriented Guided Inquiry Learning (POGIL)*. ACS Publications, 2008.
- [5] Amplify Website. Amplify website. <https://learning.amplify.com/>.
- [6] CS PROGIL Website. Introduction to cs pogil. <https://introcspogil.org/>.