



Impacts on Students' STEM Engagement, Interest, and Learning

The Arizona STEM Acceleration Program (ASAP) is a novel project designed to address learning loss induced by the COVID-19 pandemic among under-resourced schools. By offering extensive professional development opportunities, K-12 educators are empowered to implement state-of-the-art STEM (science, technology, engineering, and math) instruction in their classrooms and schools. During its first year, ASAP awarded fellowships to a select group of educators across the state of Arizona and leveraged partnerships with various community-based organizations to support the professional development, curricular and pedagogical enhancement, and resource access required to promote equitable, quality STEM education in classrooms and schools. As such, K-12 students across the state of Arizona were afforded opportunities to benefit from novel and enriched pedagogies designed to accelerate STEM education and remedy learning loss induced by the pandemic. Over the course of the project, ASAP Fellows observed and reflected upon their students' responses to the content delivery methods. Specifically, teachers noted any perceived changes in student engagement, overall interest in STEM, and learning outcomes.

The purpose of this brief is to explore ways in which ASAP Fellows' participation in the fellowship may have indirectly impacted their students. While gauging programmatic effects on student learning is not explicitly outlined in the formal set of program objectives or evaluation questions, ASAP strives to examine potential student impacts (namely in areas of engagement, interest in STEM, and STEM learning) as secondary outcomes of the program. Fellow surveys are cross-referenced longitudinally and combined with qualitative interview data from ASAP Fellows to illustrate ASAP Fellows' perceptions of how their participation in the fellowship has driven change in student reception and behavior.

Having reached thousands of students across the state of Arizona, the two-year span of the project consistently demonstrated notable and positive change in many facets of student outcomes. Quantitative and qualitative gleaned from ASAP Fellows over multiple time points highlighted:

- **Significantly increased student engagement and focus.** Following Year 1, A strong majority of respondents strongly affirmed that their students appeared to be more engaged (85.5%) and more focused during STEM activities (78%). Likewise, at the end of Year 2, a strong majority of respondents strongly affirmed that their students appeared to be more engaged (90.1%) and more focused during STEM activities (87.7%). These results were especially pronounced among ASAP Fellows representing Title 1 and/or rural schools.

- Per paired sample T-tests, this amounted to a statistically significant increase in student engagement in Year 2 in comparison to Year 1. Further paired sample proportions tests revealed significant increases in:
 - » **Student attentiveness** (P = 0.942) in comparison to the mid-point of year 2 (P = 0.878).
 - » **Student participation in applied and hands-on learning** (P = 0.986) in comparison to the mid-point of year 2 (P= 0.946).
 - » **Student attendance** (P = 0.597) in comparison to the mid-point of year 2 (P = 0.511).
 - » **Student collaboration** (P = 0.948) in comparison to the mid-point of year 2 (P = 0.892).
 - » **Student participation in applied and hands-on learning** (P = 0.963) in comparison to the mid-point of year 2 (P = 0.912).
- **Increased student interest and excitement around STEM.** Following Year 1, a strong majority of respondents strongly affirmed that their students appeared to be more excited about STEM (85.9%) Likewise, at the end of Year 2, a strong majority of respondents strongly affirmed (yielding that their students appeared to be more excited about STEM (90.8%). These results were especially pronounced among ASAP Fellows representing Title 1 and/or rural schools. Further paired samples proportion tests revealed statistically significant increases in:
 - » **Student interest in STEM at the end of year 2** (P = 0.919) in comparison to the mid-point of year 2 (P = 0.879).
 - » **Student interest in pursuing STEM degrees or majors in college at the end of year 2** (P = 0.692 in comparison to the mid-point of year 2 (P = 0.512).
 - » **Student interest in pursuing STEM careers at the end of year 2** (P = 0.761) in comparison to the mid-point of year 2 (P = 0.571).
 - » **Student engagement in STEM concepts outside of class at the end of year 2** (P = 0.748) in comparison to the mid-point of year 2 (P = 0.584).
 - » Incidences of students reading/working ahead on STEM activities increased at the end of year 2, although marginally.
- **Reaffirmed interest in STEM degrees and/or careers.** Following Year 2, a strong majority (91.2%) of respondents agreed that their students' interest in STEM in general had been bolstered, while nearly three-quarters (74.2%) of respondents indicated likewise regarding their students' interest in STEM degrees and/or careers.
- **Improved learning outcomes.** Following Year 2, Fellows consistently reported improved scores on tests/quizzes or class assignments, increased utilization of new technologies, and increased understanding of STEM concepts. These results were especially pronounced among ASAP Fellows representing Title 1 and/or rural schools.
- Per paired samples T-tests, this amounted to a statistically significant increase student in Year 2 comparison to Year 1. Further paired sample proportions tests revealed statistically significant increases in:
 - » **Student understanding of STEM at the end of year 2** (P = 0.889) in comparison to the mid-point of year 2 (P = 0.848).
 - » **Student academic performance at the end of year 2** (P = 0.739) in comparison to the mid-point of year 2 (P = 0.645).
 - » Student access to new technologies also increased, though marginally.