Engineering Education: Productive Struggle and Cultural Identity

Student Name: Elizabeth Mendoza

Faculty Mentor Name: Odesma Dalrymple

Department: Shiley-Marcos School of Engineering

University of San Diego®

OFFICE OF UNDERGRADUATE RESEARCH

Project Abstract:

This project describes my inaugural journey in the field of engineering education research. It describes: a) the process of learning about the field; b) identifying questions of interest which were: (1) why is there such little diversity in STEM departments? (2) how does the STEAM Academy help students embrace failure as a critical part of STEAM learning? and (3) how does the STEAM Academy affirm students' cultural and linguistic identity in STEAM?; c) defining an approach for investigating these questions in the S(TEAM)² Academy, a 2-week-long summer enrichment program for middle and high school students, and d) the outcome of the implementation of the research, including the changes that occurred to the focus and the current pathway it has led me to.
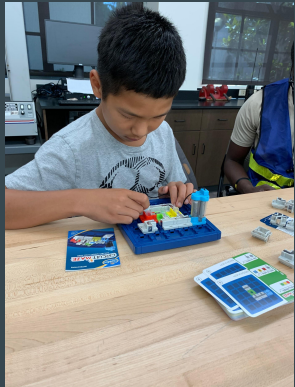
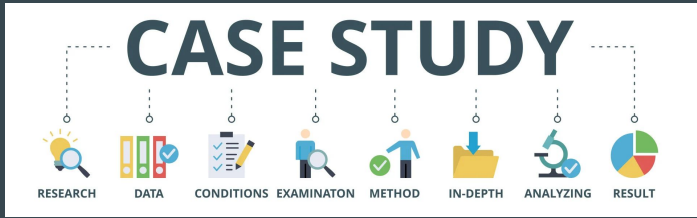**Keywords:** STEAM, productive struggle, cultural identity

STEAM Academy

What Is It?

➢ A program for middle and high schoolers from a low-income area
➢ Challenges students in STEAM skills
➢ Address society's most pressing issues
  ○ Poverty and unequal access to education

CASE STUDY

RESEARCH   DATA   CONDITIONS   EXAMINATON   METHOD   IN-DEPTH   ANALYZING   RESULT

Methodology

Case Study Format

A process or record of research in which detailed consideration is given to the development of a particular person, group, or situation over a period of time

Application

➢ Worked with a group of 5-6 middle schoolers
➢ Charting their experiences
➢ Came up with questions
➢ Mainly qualitative
  ○ Interviews and observations

Reflections and Findings

Change of Direction

➢ Removal of question related to affirming linguistic identity in STEM
➢ Interviews were not practical
➢ Looked at the reflections of all students

Findings

➢ Same education ≠ equal education
➢ Internalization of failure
➢ Perception and interest in STEM

Future Research and Conclusion

Future Research

➤ Convey a series of interviews
  ○ 16 questions
  ○ Hour long
➤ Focus on cultural + linguistic identity
➤ Answer research questions

Conclusion

➤ Certain themes connected with literature
➤ "Failure" to productive struggle
➤ Lessons learned
  ○ Plans change
  ○ Adapt
  ○ Be willing to try
  ○ Don't underestimate