Creating Equitable Pathways to STEM Careers: A Multi-faceted Approach for Underrepresented Groups

IAEVG Symposium Session
13 November 2024

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Session Overview

Presentation #1
Developing a STEM Career Administrative Guide to Cultivate STEM Career Aspirations
Presentation #2
Exploring the Long-term Impact of a Financial Literacy Program on Girls' Financial Knowledge and Skills and Transition to Adulthood
Presentation #3
Enhancing STEM Self-Efficacy and Career Identity in Underrepresented Youth through Culturally Responsive Learning Activities

Interacting with Our Session

Join our Google Doc.

Please Share Name, Country and then Comments, Resources, Questions

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Developing a STEM Career Administrative Guide to Cultivate STEM Career Aspirations

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13 November, 2024

Agenda

- Introduction
- Aims
- Method & Procedure
  - STEM Career Competencies Model
  - STEM Career Competencies Scale
- Collaborating with Community-Based Organizations
- Xello Lessons and Educator Guide
- Summary & Final Thoughts

Introduction:

- Skills and Employment Gap in STEM
  - Lack of relevant skills and competencies for STEM career fields
  - Persistent disparities in STEM employment remain, driven by factors such as gender, race, and ethnicity (Desikan et al., 2023; NCSES, 2023)
- Supporting STEM Career Development
  - Developing STEM career skills and competencies to promote STEM career identity, interest, and aspiration (Sadler et al., 2012; Wang & Degol, 2017)
- Strategies to Support Diverse Students
  - Implementing early and ongoing programs (Falco, 2017)
  - Promoting self-efficacy among students (Cagle et al., 2018)

Research Aims

1. Develop STEM Career Competencies Model and Scale.
2. Design culturally responsive lessons and activities incorporating the model and scale.
3. Validate the scale and lessons with a larger group.

Method & Procedure

1. Developing STEM Career Competencies **Model**

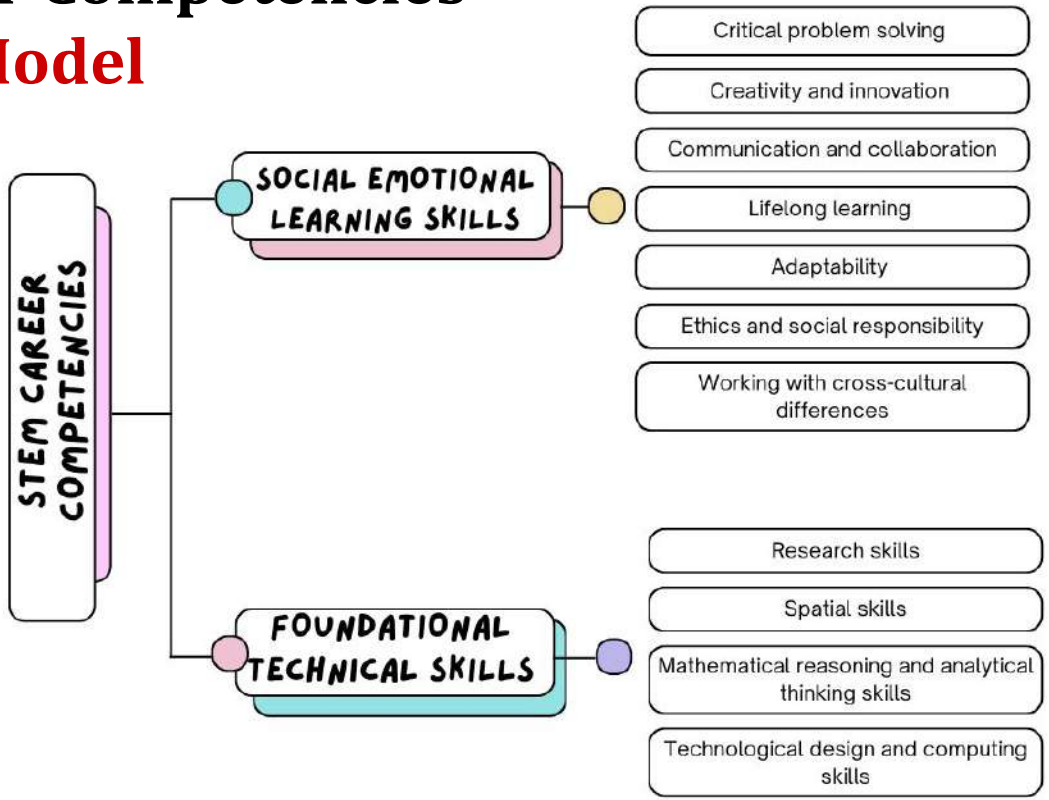
2. Developing STEM Career Competencies **Scale**

3. Creating Career Lessons incorporating STEM Competencies
   a. Sample Lessons focused on durable skills
   b. First Pilot Study with Community-Based, Youth-Serving Organizations (n=31)

4. Designing STEM Administrative Guideline incorporating STEM Career Lessons

5. Testing the Scale with a National Organization (n =1,172)

STEM Career Competencies Model



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STEM Career Competencies Scale

STEM CAREER COMPETENCIES SCALE

Read each statement below related to STEM (Science, Technology, Engineering, and Mathematics) and choose the answer that best describes how you feel.

	ITEMS	1	2	3	4	5
Item no.	**To what extent, do you feel confident in your ability to...**	Very unconfident	Unconfident	Neither Confident nor unconfident	Confident	Very confident
1	Identify problems					
2	Solve problems using a new perspective					
3	Identify a topic you want to investigate					
4	Cooperate with your peers to achieve shared goals					
5	Continue to learn beyond school					
6	Use maps to find a location					
7	Be comfortable with unexpected changes					
8	Understand mathematical problems in your grade-level math coursework					
9	Think before you act					
10	Edit technological designs based on feedback					
11	Explore ways you are similar and different from peers					
12	Break down complex issues into smaller parts					

Collaborating with Community Based Organizations

- Solicited feedback from two Boston-based organizations, **Sociedad Latina** and **West End House**, who work with diverse youth across the city.
  a. Their staff and students provided early feedback on readability and suitability of STEM assessment scale items and lessons.

- Solicited feedback from our national State Leaders Career Development Network (SLN).
  a. The SLN consists of secondary and post-secondary counselors, district leaders, educators, administrators and more from across the country.

STEM Assessment and Lessons

Lesson 1: Describing Yourself

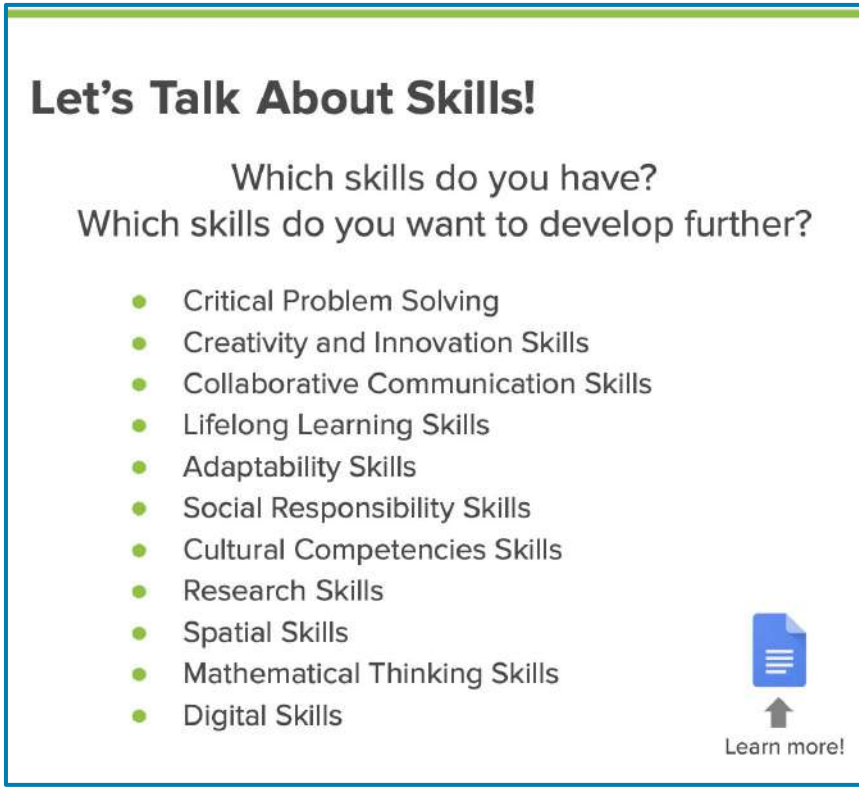
- Students completed the STEM Career Competency Scale and discussed with their peers the central role of Durable Skills.

Lesson 2: Starting and Improving a resume

- Student's used Xello resume-building tools and followed instructional videos to plan and build their resumes.

Lesson 3: STEM Career exploration

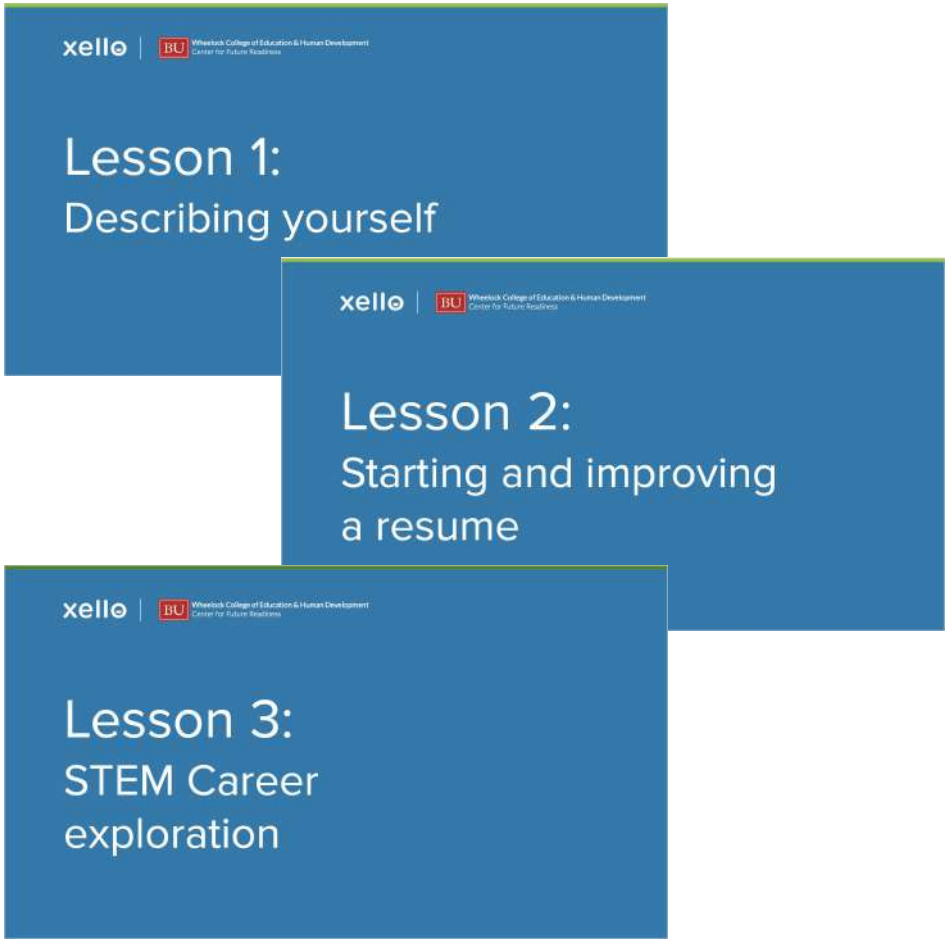
- Students used Xello's 'Explore Careers' tools and resources, and collaborated with their peers to learn about multiple education and career pathways.



From 'STEM Competencies Lesson 2'

STEM Assessment with Xello

- Solicited support from a career technology firm – **Xello** – to gather data to validate the scale
  a. The assessment was incorporated into the beginning of "Who Am I" lesson series
- **Xello** prepared the assessment and three-lesson activity within their platform.



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Lesson 3: STEM career exploration (~60 mins)

Learning objectives

- Expand your awareness of occupations that connect to your skills
- Discover how the skills you're developing expand your future occupational opportunities
- Start building a plan towards a future in STEM

Presentation deck:

Experience	Topic/Overview
Discussion Prompt 10 mins	**Past experiences and career aspirations** • What skills have you used in previous work? • What careers could you use those skills in?
Activity: Career Exploration 20 mins	**Explore Pathways and STEM Career Cluster search**  • If possible, divide students into 8 or more small groups and assign each group one of the Career Pathways: 2 year college, 4 year college, Apprenticeship, Entrepreneurship, Military, Supported Training or Living, Straight to Work, and Vocational training. • Each group will review the assigned Pathway profile in Xello before selecting 2 STEM-related careers within the pathway to share back
Pair - Share 10 minutes	**Share your pathway with another group** • Have the student groups pair up and each group will share what they learned about potential careers within their pathway. • This will allow peers to learn more about their academic and career options, with easily comparable information from each.

"Educator Guide" for added Educator support

- Each lesson was accompanied by detailed lesson prompts and guidance for educators.
  a. Timing marks
  b. Learning objectives
  c. Important links
  d. Graphics for guidance
  e. Grouping and activity breakdowns
- A priority was ensuring impactful lesson delivery and the lesson's ability to adapt to diverse student needs.

Final Thoughts

Lessons Learned:

- Consider and Incorporate feedback from educators and partners
- Remain flexible to meet student needs
- Gather feedback from students and parents and continuously improve

Key benefits:

- Bringing the research into the classroom
- Collaborating with community partners enriches the research with insights from practitioners working closely with underrepresented youth
- Adopting participatory approach builds capacity for culturally responsive STEM career development programming, empowering educators to effectively support their students

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THANK YOU!

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Exploring the Long-Term Impact of a Financial Literacy Program on Girls' Financial Knowledge and Skills and Transition to Adulthood

Kimberly A. S. Howard, Chong Park, & V. Scott Solberg

Boston University

Study Background

Gender gaps persist in finance industry

- Women earn 76% of male counterparts' earnings (Deloitte, 2022)
- Women hold only 23% of executive committee roles (Deloitte, 2022)
- Women remain underrepresented in lucrative sectors, comprising only 37% of funds, trusts, and financial investments workforce (U.S. Bureau of Labor Statistics, 2022)

Financial literacy gap is a fundamental issue

- Women score consistently lower on personal finance knowledge, leading to increased time spent on financial decisions (TIAA Institute and GFLEC, 2022)
- Gender gap in financial literacy emerges early and persists throughout life (Batty et al., 2015; Danes & Haberman, 2007; Lusardi & Mitchell, 2010)

Invest in Girls
A PROGRAM OF THE
COUNCIL FOR ECONOMIC EDUCATION

"Usher in the next generation of financially literate girls and increase the number of women working in finance and financially related fields."

IIG 3-Modules

- Be the Chief Financial Officer of Your Life (e.g., creating a budget, using credit cards, and careers in finance)
- Be the Chief Investment Officer of Your Life (e.g., saving vs. investing, stocks, bonds, and funds)
- Be the Chief Executive Officer of Your Future (e.g., interviewing and negotiating skills, building a financial safety net)

Research Questions

- How does financial literacy knowledge from IIG manifest in participants' behaviors and skills?
- How do participants' perceptions of the IIG curriculum evolve over time?
- How do financial education needs change over time?

Research Methodology

- 4-year longitudinal qualitative study (2019-2023)
- 98 total interviews with Invest in Girls (IIG) alumnae

Cohort	1-year post	2-year post	3-year post	4-year post
Fall 2019	7 students	5 students (Fall 2020)	7 students (Fall 2021)	7 students (Fall 2022)
Spring 2020	8 students	5 students (Spring 2021)	4 students (Spring 2022)	3 students (Spring 2023)
Fall 2020	2 students	2 students (Fall 2021)	2 students (Fall 2022)	-
Spring 2021	18 students	13 students (Spring 2022)	12 students (Spring 2023)	-
Fall 2021	2 students	1 student (Fall 2022)	-	-
Total (98 interviews)	37	26	25	10

- Semi-structured annual interviews via Zoom
- Thematic analysis using NVivo software

Key Findings

Progression from <u>Basic</u> to Complex Knowledge and Skills:

Basic credit knowledge (Years 1-2)

"I think the most helpful topic is to distinguish between credit card and debit card." (Student D10)

"I remember the biggest piece of advice they were giving was to start building credit as soon as possible. So, when I turned 18, I signed up for credit cards." (Student M13)

Simple budgeting (Years 1-2)

"I made a spreadsheet of my budget because that's one of the things that they showed us that you could just do at home." (Student M12)

Key Findings

Progression from Basic to <u>Complex</u> Knowledge and Skills:

Using credit knowledge in a practical way (Years 3-4)

"I use my Bank of America card whenever I'm purchasing anything online because I get 3% back. But then I use my Amex blue card for gas purchases because then I also get 3% on that." (Student A25)

Shift to complex budgeting (Years 3-4)

"So, now I have to factor in groceries. I have my car on campus, so I have to factor in gas. There's more budgeting, and I felt really prepared to deal with that" (Student S1).

Key Findings

Increasing Financial Independence:

College expense management (Years 1-2)

"I expect to know my budget by heart because college can be really expensive and I don't really want to put that weight on my parents" (Student M12).

Off-campus housing and saving/investment planning (Years 3-4)

"At the beginning of each semester, I make a budget with how much I'm going to spend to make sure I can pay my rent and my utilities, and also enough for food, and have something set aside to do fun things with my friends, and then some that I'm saving." (Student S65)

Key Findings

Need for Additional Tax Education

Feeling unprepared for taxes (Years 1-2)

"I probably want to know a little bit more about taxes. We brushed over it a bunch of times... But now that I do my taxes now, I think I have so many questions that I'm always asking." (Student Y3)

Growing Complexity of Tax Situations (Years 3-4)

"I didn't realize I get taxed twice, and I feel like that's something should have been talked about. Because I get tax from New York because I'm from here, and that's where all my documents are out, but then I get tax from Massachusetts because that's the location where I work." (Student Y7)

Next Steps in Research

- Current Study Focus
  - Examined IIG program's impact on alumnae’s financial knowledge, behaviors, and skills

- Expanding Research Scope
  - Examining influences on career and life trajectories
  - Leadership role and advancement, especially in male-dominant industries

Conclusion

- The long-term impact of the IIG program
  - Evolution from basic credit knowledge to strategic credit utilization
  - Progression from simple expense tracking to comprehensive budget management
- Areas for improvement
  - Critical need for expanded tax education
  - Opportunity to align curriculum with students' developmental stages

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Thank you!

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CFO, CIO, and CEO Modules

CFO Workshop 1: Attitudes Toward Money & How to Create S.M.A.R.T. Goals
CFO Workshop 2: Basic Money Management & Creating a Spending Plan
CFO Workshop 3: Introduction to Savings Plan & Interest
CFO Workshop 4: Introduction to Credit Cards
CIO Workshop 1: Basics of Investing & Stock Market
CIO Workshop 2: Investing – Importance of Diversification
CIO Workshop 3: Planning for Retirement
CIO Workshop 4: Finance Careers & How to Become One
CEO Workshop 1: Invest in Yourself – Paying for College
CEO Workshop 2: Income Tax & Insurance
CEO Workshop 3: How to Get the Job You Really Want: What makes a strong resume, how to decide between multiple job offers, and the importance of salary negotiations
CEO Workshop 4: Philanthropy: How to Give Back to Your Community

Interview Questions

1. When you think back to the IIG curriculum what are the topics that you found to be most helpful?
2. What financial literacy skills are you using presently?
3. What financial literacy skills do you expect to be using in the next year?
4. How have these skills supported your transition into adulthood?
5. What additional financial skills would you have liked to have learned before leaving high school?
6. What are your current career and life goals?
7. How has your experience in learning about financial literacy affected your decision about these goals?

Enhancing STEM Self-Efficacy and Career Identity in Underrepresented Youth through Culturally Responsive Learning Activities

Network Science For All:
Positioning High Need Youth for Success in Pursuing STEM Pathways

Wheelock College of Education & Human Development
Center for Future Readiness

Presentation Aims

- Describe the design and implementation of a collaborative participatory action research effort
- Highlight key components of culturally responsive learning activities
- Provide evidence of students' increased self-efficacy and career identity development

BOSTON UNIVERSITY

SOCIEDAD LATINA
FORTALECIENDO JÓVENES Y FAMILIAS
STRENGTHENING YOUTH AND FAMILIES

NSF

Collaboration

DEVELOPING SHARED VISION

BRAIDING OUR COLLECTIVE TALENT AND SKILLS

GATHERING FEEDBACK

Project Overview

- Community participatory action research (2020-2024)
- Co-design, implement, and evaluate an evidence-based career development curriculum that is **culturally responsive** and enables youth to explore, consider, and pursue STEM career pathways
  - 21 network science and 20 career lessons (English & Spanish)
  - STEM role models from Latinx communities
  - Community-based civic engagement projects (e.g., COVID vaccine PSA video)

Network Science Lessons | Career Lessons | Role Model Sessions & Civic Engagement Project

Curriculum

Network Science lessons: Using the basic STEM principles (e.g., water in chemistry, circuits in physics, and viruses in biology), the lessons were extended to "network thinking" and its real-life applications.

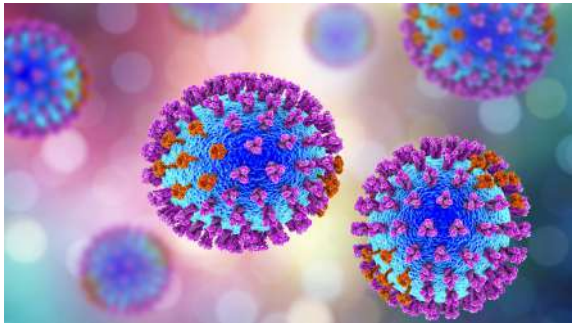
Career lessons: Youth develop awareness of STEM education, training, and occupational opportunities. Specifically, career lessons guide youth to:

- Identify their STEM talent and skills
- Explore STEM career pathways aligned with their skills
- Develop technical and professional skills for their chosen pathways

Sample Lesson "Networks and Diseases"

Lesson Goals:

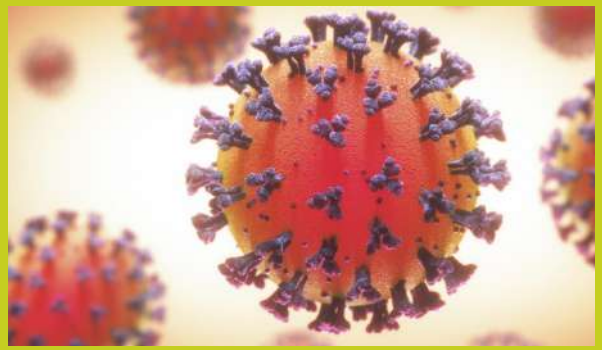
- Understand the relationship between the nodes within a network with the spread of viruses
  - *Entender la relación entre los nodos en una red y la expansión del virus*
- Understand which "nodes" can be vaccinated to decrease the spread of a virus
  - *Entender cuáles nodos podrán ser vacunados para evitar la expansión*
- Understand vaccination and quarantine strategies when dealing with a virus
  - *Entender estrategias de vacunas y cuarentena para bregar con un virus*



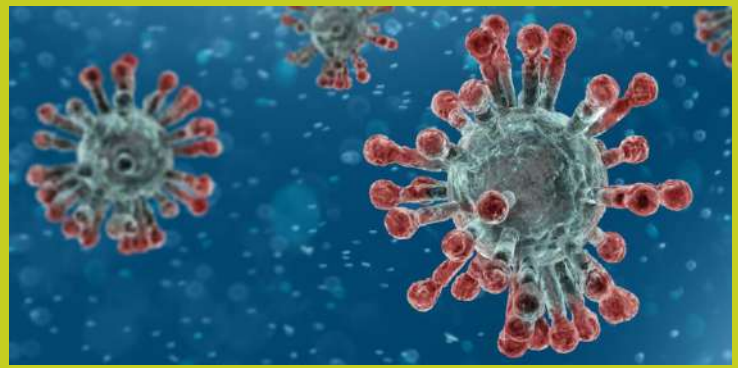
Vocabulary

- Virus: a tiny, infectious particle that lives inside of living organisms
- Vaccine: substance that helps protect against certain diseases and contain a dead or weakened version of a microbe

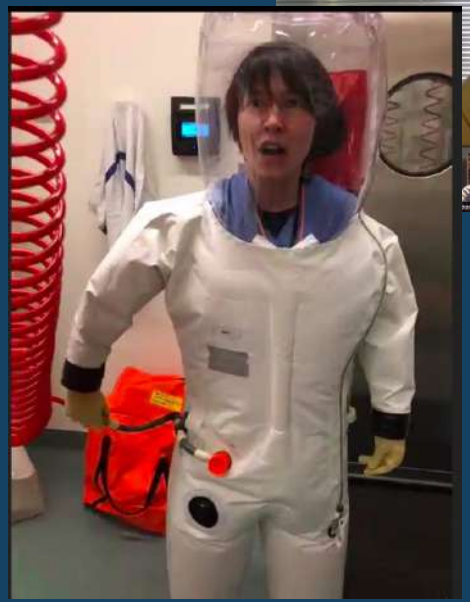
- *Virus:una partícula pequeña e infecciosa que vive dentro de los organismos vivos*
- *Vacuna: Una sustancia que ayuda a proteger contra ciertas enfermedades y contiene una versión muerta o debilitada de un microbio*



Can you guess what a virologist does?
Puedes adivinar qué hace un virólogo?

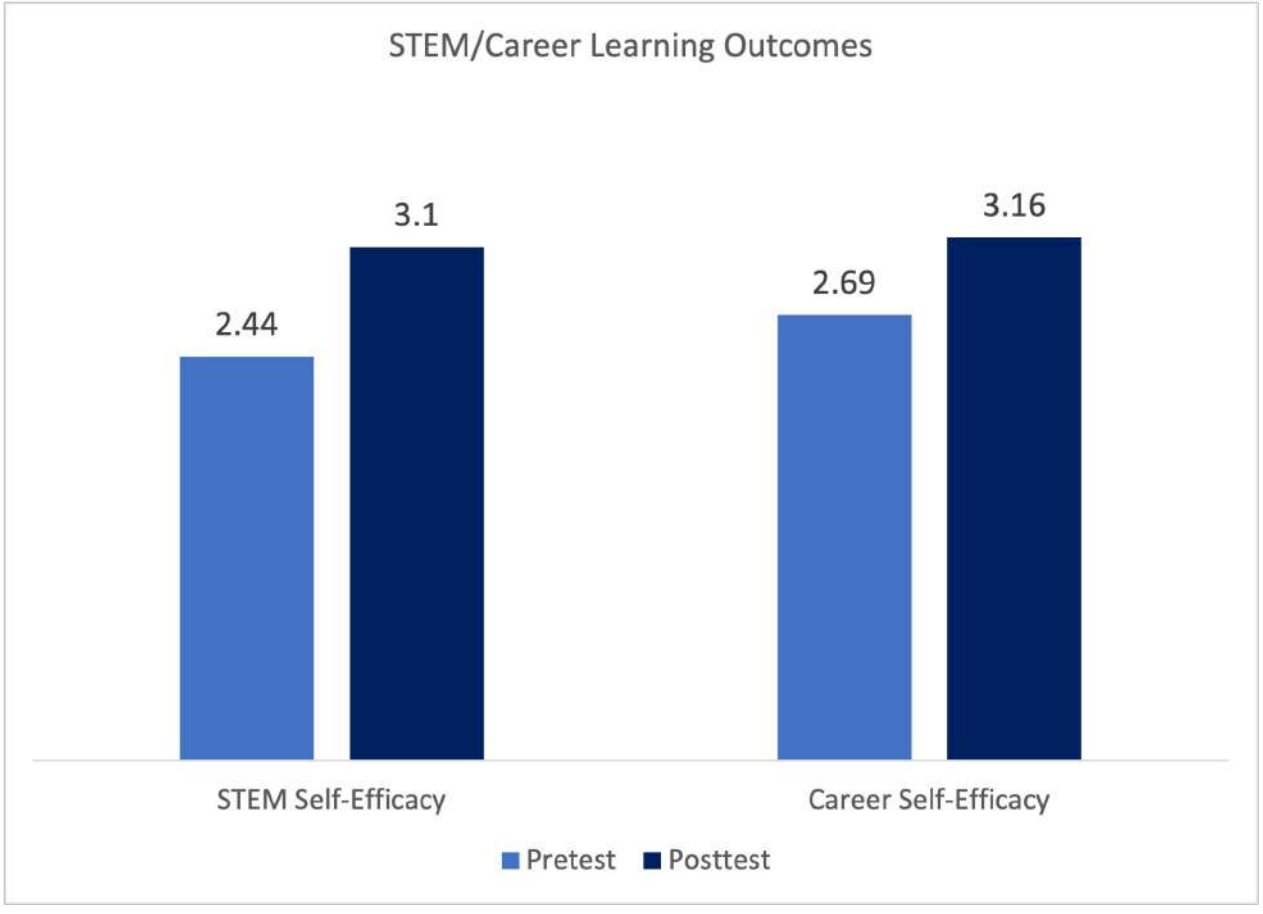


STEM Role Models



Civic Engagement

Self-Efficacy in STEM Learning & Career Development



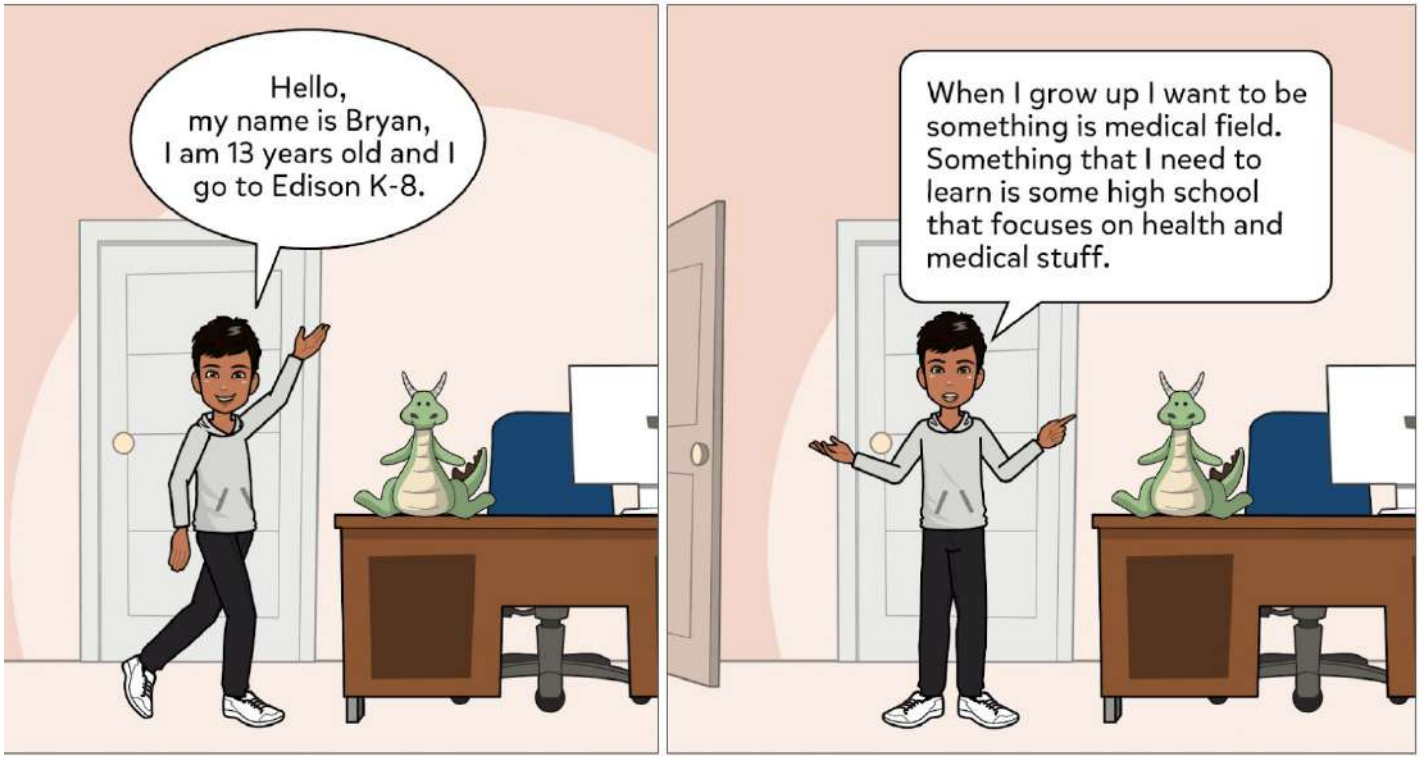
Establishing Evidence for Career Readiness

Using a Life Design perspective, we are seeking narrative evidence for:

- **Reflection** – identifying one's talent and skills
  - *"I love drawing and want to share my talents with the world.*
- **Identity** – Connecting talent and skills to occupational goals
  - *"I want to be an artist"*
- **Reflexivity** – engaging in actions to pursue identified goals
  - *"I am taking art classes to learn more and also after-school I create different arts to learn what I need to improve."*

Career Identity: Sample Student Responses

Pretest



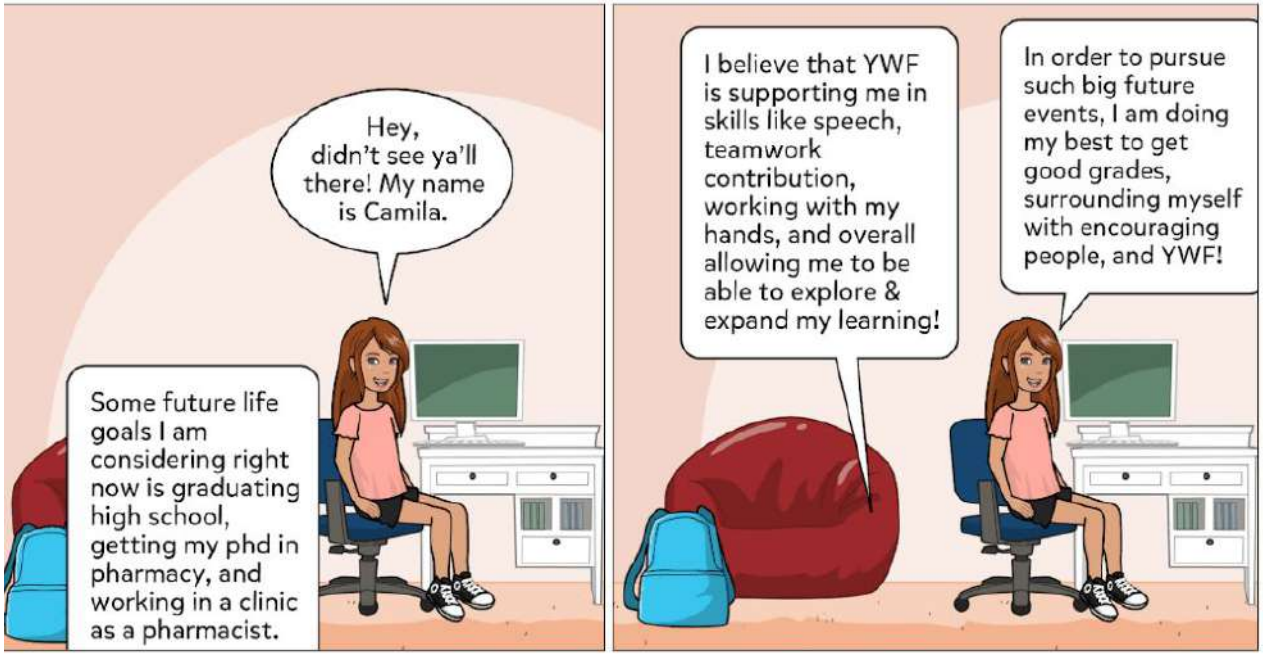
Career Identity: Sample Student Responses

Posttest

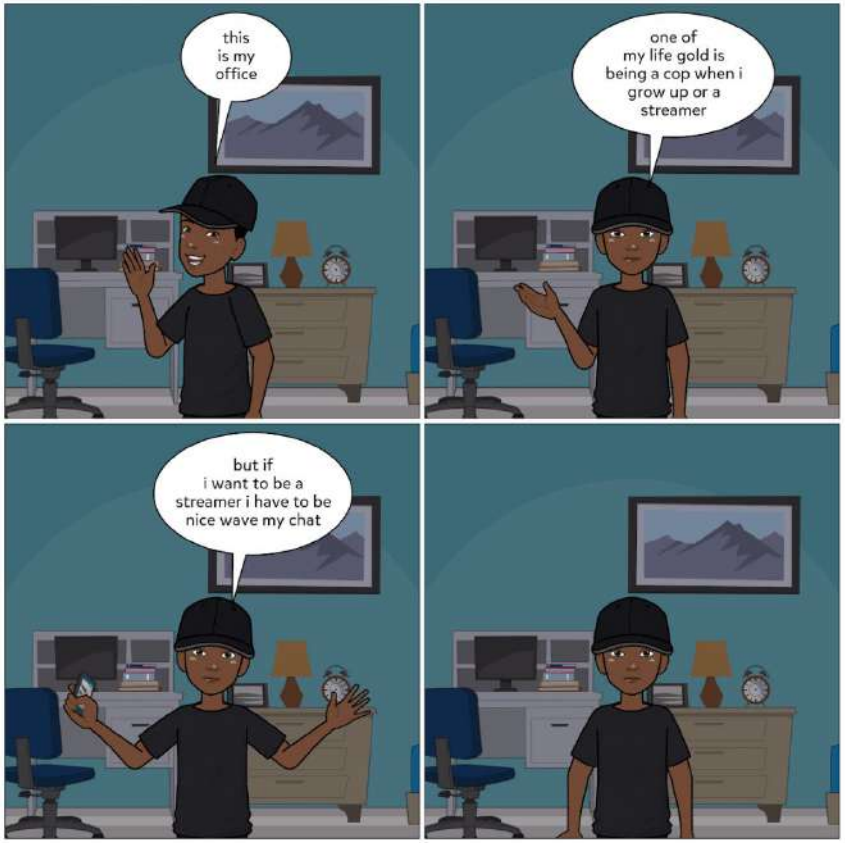
Career Identity: Sample Student Responses

Pretest

Posttest



Sample Student Responses: Pretest



Sample Student Responses: Posttest

Key Outcomes

- Strengthened self-efficacy and STEM career identity among Latinx middle school youth
- Empowered students to develop actionable career pathways and achievable goals
- Increased representation of Latinx youth in high-demand, high-wage STEM career pathways

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¡Gracias!

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Creating Equitable Pathways to STEM Careers: A Multi-faceted Approach for Underrepresented Groups

IAEVG Symposium Session
13 November 2024

Discussant: Assoc. Dr. Lea FERRARI
Department of Philosophy, Sociology, Education and Applied Psychology
University of Padova
Italy

STEM's Impact on European Industries

1

Manufacturing Growth

STEM-educated workers significantly contributed to manufacturing sector growth from 1995 to 2019.

2

Higher Income

STEM workers showed higher income compared to other sectors.

Bacovic, Andrijasevic & Bojan 2021

European STEM Initiatives

1

EU STEAM Coalition

Network of national EU STEM platforms promoting better policies and implementation.

2

NESET Report

August 2024 report on gender gap in STEM education across educational levels.

3

Ongoing Projects

Various projects investing in STEM education across Europe over the years.

- GirlsInScience Building an Evidence-Base for Reducing **Gender Bias** in Educational Pathways
- EQUALS-EU Europe's Regional Partnership for **Gender Equality** in the Digital Age
- Boys have talent, girls work hard: how **parents and teachers** perpetuate gender biases
- **Innovative approach** to communication encouraging girls to study science
- A better, more **gender-inclusive way** to teach science
- Reducing the gender gap in STEM fields for **better research and innovation**

Gender Gap in STEM Education

Self-Efficacy

Girls often show lower self-efficacy in STEM subjects despite similar or better performance.

Social Context

Family and social environment play vital roles in shaping girls' STEM decisions.

Institutional Barriers

Non-inclusive curricula and teaching practices reinforce stereotypes and lack of female role models.

More should be done

(Cedefop 2023, Skills in transition. The way to 2035)

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Evidence-Based STEM Skill Model

1. **Social-Emotional Learning**
   Integrate SEL principles into STEM education. This fosters resilience, collaboration, and emotional intelligence.

2. **Technical Foundations**
   Build a strong base of core STEM concepts. Ensure students grasp fundamental principles.

3. **Skill Validation**
   Develop a comprehensive scale to measure STEM competencies. Track progress and identify areas for improvement.

Innovative Training Program Design

Focused Content

Deliver concise, targeted lesson. Maximize learning impact in shorter time frames.

Maybe a module that could be combined with other modules

Learning Guides

Provide structured pathways to achieve goals. Ensure consistent progress across diverse student groups.

Flexible Dialogue

Incorporate student feedback and needs.

Adapt curriculum to maintain relevance and engagement.

UDL Principles

Implement Universal Design for Learning. Accommodate various learning styles and abilities.

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Exploring the Long-Term Impact of a Financial Literacy Program on Girls' Financial Knowledge and Skills and Transition to Adulthood

Kimberly A. S. Howard, Chong Park, & V. Scott Solberg

Boston University

Interdisciplinary Approach

Vocational Psychology

Explores career aspirations and personal strengths. Helps girls align their passions with potential careers.

Career Education

Provides practical insights into various professions. Equips girls with knowledge about job markets and requirements.

Financial Know-how

Teaches essential management skills. Empowers girls to make informed financial decisions for their future.

Longitudinal Design

Qualitative Analysis

1 Co-construction

Girls actively participate in shaping the educational content. Their voices are central to the program's development.

2 Meaningful Education

Content is tailored to real-life experiences. It resonates with participants' present and future challenges and aspirations.

3 Rich Insights

Qualitative approach reveals nuanced understanding. It captures the transformative journey of each participant.

Role Models and Advocacy

1

Identify Role Models

Successful program graduates become inspirational figures.

2

Foster Mentorship

Graduates return to mentor new participants. They share personal experiences and provide guidance.

3

Promote Advocacy

Empowered girls become agents of change. They advocate for a ‘PINK' financial literacy in their communities.

Enhancing STEM Self-Efficacy and Career Identity in Underrepresented Youth through Culturally Responsive Learning Activities

Network Science For All:
Positioning High Need Youth for Success in Pursuing STEM Pathways

Wheelock College of Education & Human Development
Center for Future Readiness

Perspective

Target reality

Knowledge about the world of work was provided taking inspiration from the everyday life situation framing a new way of reading reality

Communication strategy

Starting way of collecting data was innovated using youth languages and ways of communicating used by youth

FUN

Learning is a fun experience. Fostering interest, curiosity, motivation

Oil in the machinery to ride the wave

Teacher Development in STEM

1

Positive Attitudes

Address gender biases in STEM education. Promote inclusive teaching practices and role models.

2

Continuous learning

Offer ongoing professional development opportunities. Keep teachers updated on latest STEM advancements and pedagogies.

3

Collaborative Networks

Facilitate teacher-to-teacher mentoring and knowledge sharing. Build a supportive community of STEM educators.

Parental Involvement Strategies

Parent Education

Offer workshops on STEM careers and opportunities. Build parental confidence in supporting their children's STEM interests.

Home Activities

Provide take-home STEM kits and projects. Encourage family engagement in hands-on learning.

Communication Channels

Establish regular updates on student progress. Use technology to keep parents informed and involved.

Community Stakeholder Engagement

1

Identify Partners

Research local businesses, organizations, and institutions with STEM interests. Create a database of potential collaborators.

2

Outreach Initiative

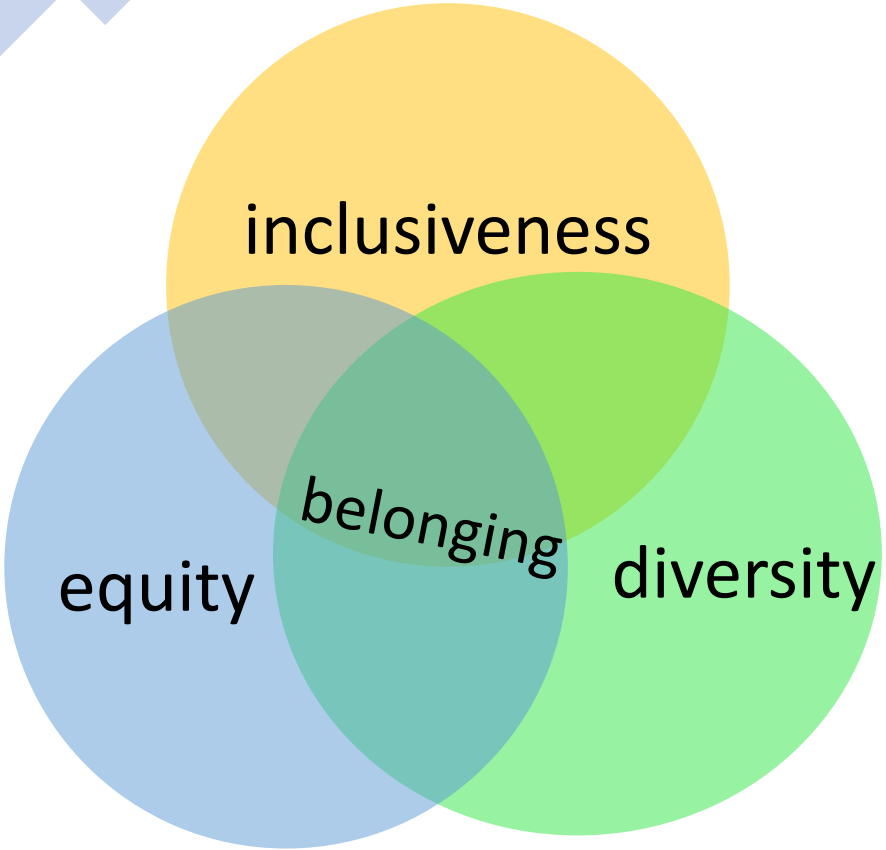
Develop compelling proposals for partnerships. Highlight mutual benefits and potential impact on students.

3

Collaboration

Establish ongoing relationships with stakeholders. Integrate their expertise into the STEM curriculum.

DEIB M approach



- ✔ **D.** Actively recruit and support students and educators from underrepresented groups in STEAM fields.
- ✔ **E.** Break the barriers of school segregation promoting access to learning
- ✔ **I.** Expanding individual's capability and opportunities and create a space for participating and act together
- ✔ **B.** Co-creation encourages students to become active participants in shaping their learning environment, fostering a sense of ownership over their education and allow to develop a sense of belonging that impact the identity development