**Introduction and objectives**

Educational language policy and engagement action research (ELPEAR) is a reflective and collaborative research method focused on analyzing critical power dynamics in language policy and effecting positive change in education. As part of the doctoral course BED 6318 Language policy in education, the class identified a topic and research question important to us: TLC doctoral students’ experiences of language policies in TLC courses. We then designed this survey-based study to capture the voices of participants students regarding the level of support they received in various language policies and practices from faculty and peers. We used this analysis to produce recommendations for classroom practices.

**Research questions**

What are the learning experiences—in classroom participation and assignments—of UTEP TLC doctoral students whose primary language is not English? To what extent do TLC students feel that their linguistic repertoires are recognized in TLC classes?

**Theoretical Frameworks**

| Language policy as texts, ideologies, and practices (Spolsky, 2004) | Instructors and students as policymakers (Ricento & Hornberger 1996) | Translanguaging has a crucial role in pedagogical practice (García, 2009; Makalala, 2002; Schissel et al., 2019) |

**Methodology**

Our study was designed according to the action research cycle for language policy as outlined by Johnson (2013).

- **Action Research Cycle Plan (Johnson, 2013)**
- **Reformulate Plan**
- **Plan**
- **Reflect**
- **Act & Observe**

The process used to develop our ELPEAR

- Collaboratively developed and refined research question
- Data collection via survey with open ended and Likert scale questions
- Disaggregated responses and divided into qualitative and quantitative categories
- Coded and scaled questions and quantified some open-ended questions
- Analyzed qualitative data using thematic analysis
- Organized data, developed themes, verified frequencies

**Findings (continued)**

Respondents’ Perceptions of Multilingual Language Policies in TLC Courses

Want flexible language policies

Respondents request a language policy that encourages students to leverage their complete language repertoire. “We would have a more enriching experience”

Concerns about having multilingual language policies

Respondents say that there is a need to develop strategies to overcome potential language obstacles by offering resources for faculty adapting to a multilingual approach.

...it will also mean a lot of work for both professors and peers

“I don’t think everyone in my class speaks Spanish, how would they understand me?”

Interest in a diverse learning environment

Respondents value an inclusive atmosphere for international students by providing “third spaces” or areas for diverse linguistic and cultural exchange.

“You can express yourself more openly” and offer “proper time to get used to the doctoral degree program”

**Recommendations**

Recommendations for TLC doctoral program faculty:

- Make additional support explicit in syllabi
- Integrate multilingual repertoires in TLC classes
- Address potential barriers to integrating multilingual repertoires
- Create a diverse learning environment
- Invite/allow translanguaging practices in TLC courses
- Foster students’ linguistic repertoires
- Invite submission options in languages other than English

Recommendations for TLC students:

- Take advantage of linguistic accommodations
- Be supportive among peers
- Know that there is an option of dissertation language preference
- Be aware of equity of opportunities for all students

**References**


A Comparative Case Study of Early Childhood Education Teacher Well-being

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Introduction

- Teacher stress is understood to be problematic for the well-being of teachers1-2, but also for child outcomes in academic, socioemotional, and executive function development.3,4
- Early childhood education (ECE) teachers further withstand teaching stress, which accounts for the emotionality of working with young children.5
- Most research however, examines teacher and teaching stress by implementing traditional participant-reported surveys.
- Understanding the potential bias associated with surveys of self-report6, the current work examined a physiological measure of stress (hair cortisol concentration) combined with qualitative interviews to more comprehensively understand ECE teacher well-being.

Objectives

A part of a larger, on-going study characterizing the psychological and physiological stress of ECE teachers in one participating school district, the current research compared cases of ECE teachers by:
- comparing hair cortisol levels (i.e., Low, Medium, High pg/ml) and
- lived experiences including
  - sources of stress, and
  - the less-often reported affirmations of teaching

Methodology

Of the previously collected quantitative data, three teachers were selected for this comparative case study based on the collection of:
1) complete demographic and medication survey data,
2) successful sampling and analysis of hair; demonstrated difference in level of cortisol concentration5, and
3) the completion of one individual, semi-structured interview

Analysis

- Hair samples were collected and thereafter assayed according to standard protocol7 by collaborators in the Human & Animal Integrated Research (HAIR) Lab (PI: Dr. Amanda M. Dettmer, Ph.D.) located within the Yale School of Medicine's Child Study Center
- Interview transcripts were cleaned and inductively coded to reveal emerging themes8 related to ECE teacher well-being
- Taken together, the quantitative and qualitative data were analyzed to reveal a portrait of each case

Results and Findings

Table 1. Primary Secondary Tertiary Coding Themes

When comparing the three cases, the data reveal 6 main themes affecting teacher well-being:
- COVID-19 pandemic
- Teacher Responsibility
- School Structure and Logistics
- Social Effects
- Personal Effects, and
- Finances

Table 2. Comparison of Physiological Stress Level and Informing Quote

ID Hair Cortisol Concentration Value (pg/ml) Make Theme: subsequent theme Relevant Quote
14 3.0 (Low) Child, Negatives Child developmental delays “They didn't seem to care, they didn't seem like they were making any effort to see me as a human.”
3.0 (Low) Personal Life; Positives; Passion for teaching “I'm guessing I don't know if it was a stress or what it was, but I was feeling very tense and because of the whole situation, my body was acting everywhere and I did not want to accept that it was becoming a problem until I couldn't really deal well with the kids so I went to a chiropractor and he helped a ton and finally I told myself, 'okay, I need to take care of myself before I can take care of the kids at school, of my family.'”
2 4.4 (Medium) Personal Effects; Negatives; self-care “I'm guessing I don't know if it was a stress or what it was, but I was feeling very tense and because of the whole situation, my body was acting everywhere and I did not want to accept that it was becoming a problem until I couldn't really deal well with the kids so I went to a chiropractor and he helped a ton and finally I told myself, 'okay, I need to take care of myself before I can take care of the kids at school, of my family.'”

Discussion

- Our research confirmed challenging issues within the ECE profession which cause teachers undue amounts of stress.
- Matching quantitative cortisol concentration results with qualitative interview findings allowed us to more comprehensively compare experiences.
- Teaching in the ECE context is challenging. Not only are ECE teachers burdened by the profession itself (e.g., compensation), but also by the relationships with administration, maintaining a healthy work-life balance.
- While participating teachers endorsed similar stressors, Participant 14 (3.0 pg/ml; Low) revealed a love of teaching that may have offered a counterpart to stressors experienced, while Participant 8 (18.4 pg/ml; High) already sought other work.
- While this comparative case study is limited in scope and generalizability, it highlighted lived experiences that may inform the current resignation and teacher shortage crises.
- For example, these results and findings may inform policy and practice. Moving forward, perhaps teachers who demonstrate high levels of cortisol concentration could be counseled in an effort to retain and support.
- This policy and practice directive could have implications that positively impact children in the classroom as 1) teachers may be less inclined to leave, avoiding disruption in socioemotional and academic development for children, and 2) improved overall teacher well-being is known to positively affect the classroom context.
- Future studies may want to examine 1) larger samples of ECE teachers, and the 2) socioemotional, academic, and executive function outcomes of children enrolled in classrooms of teachers who demonstrate Low, Medium, and High cortisol concentration levels.

Acknowledgements

Thanks and acknowledgement are due to the ECE teachers who willingly and cooperatively participated in this study. Thanks also to research assistants Bryn Birdwell and Francisco Diego.

References


Wounded Healers: The Stigma of Mental Health Illness among Latino Graduate Students
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Introduction

Overarching Framework: Wounded Healer
Carl Jung coined the term "wounded healer" to point out the "wounding" of counselors and therapists may enable them to empathize more fully with their own clients (Fear, 2022).

Terms
Trauma: an emotional response to a terrible event like an accident, rape, or natural disaster. Immediately after the event, shock and denial are typical (American Psychological Association, 2017).

Adverse Childhood Experiences: Potentially traumatic and often common events that occur during childhood (0-17 years old) that have lasting effects on their adult lives.
Counselors-in-Training: Graduate students training counselors studying for their master’s degree in mental health, school, and rehabilitation counseling.

Objective
75% of counselors and psychotherapists have experienced emotional or psychic wounds, which led them to their careers (Fear, 2022).

Current Study
Aims to investigate the prevalence of mental health illness and the level of mental health stigma among the Latino population and the relationship between mental health stigma with other significant constructs including psychological distress and cultural values.

Methodology
After UTEP IRB approval, cross-sectional data were collected by surveys.

Participants
164 graduate students who identify as (1) Latino and (2) attend the UTEP

Gaps
✓ Stigma itself is a culturally defined construct since it is derived from shared attitudes held by individuals within a culture (Abdullah & Brown, 2011).
✓ There have been a few studies investigating mental health stigma in Latino population, but studies comparing the level of stigma across cultures have inconsistent results (Corrigan & Watson, 2007; Parcesepe & Cabassa, 2013).
✓ Moreover, Latino counselors-in-training with mental health concerns (i.e., Latino wounded healers) have not been investigated, as of our knowledge.

Adverse Childhood Experiences: Potentially traumatic and often common events that occur during childhood (0-17 years old) that have lasting effects on their adult lives.
Counselors-in-Training: Graduate students training counselors studying for their master’s degree in mental health, school, and rehabilitation counseling.

Internalized Mental Health Stigma: Self-stigma usually describes a process in which an individual with mental health concerns internalizes the stigma and then experiences diminished self-esteem and self-efficacy, limiting prospects for recovery (Rossier, 2016).

Latino/Latino/Latina/Latino/Latina/Latina/Latina/Latina: Hispanic and Latino are often used interchangeably but they mean two different things. Hispanic refers to people who are from or descended from people from Latin America.

Previous Evidence of Wounded Healers
✓ 75% of counselors and psychotherapists have experienced emotional or psychic wounds, which led them to their careers (Fear, 2022).
✓ Among faculties and graduate students who are in clinical, counseling, and school psychology, more than 80% respondents reported a lifetime history of psychological distress, and nearly half (48%) reported a diagnosed mental disorder (Victor et al., 2022).

Methodology
After UTEP IRB approval, cross-sectional data were collected by surveys.

Participants
164 graduate students who identify as (1) Latino and (2) attend the UTEP

Gaps
✓ Stigma itself is a culturally defined construct since it is derived from shared attitudes held by individuals within a culture (Abdullah & Brown, 2011).
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✓ Moreover, Latino counselors-in-training with mental health concerns (i.e., Latino wounded healers) have not been investigated, as of our knowledge.

Current Study
Aims to investigate the prevalence of mental health illness and the level of mental health stigma among the Latino population and the relationship between mental health stigma with other significant constructs including psychological distress and cultural values.

Specifically, two specific research questions guided the study:
1. to examine whether Latino counselors-in-training would have a higher prevalence of mental illness compared to other Latino graduate students and (2) to test whether cultural values predict mental health stigma among Latino graduate students.

Measures
Demographic questionnaire
Kessler Psychological Distress Scale (K10) for psychological distress
Cultural Values Scale (CVSCALE)
Internalized Stigma of Mental Illness (ISMI) scales
Social Withdrawal, and (5) Stigma resistance

Data Analysis
The data were analyzed via t-test and regression using SPSS

Results
1. Latino counselors-in-training reported more having official mental health diagnoses compared to other Latino graduate students (Phi = .25, p < .01).

2. Internalized mental health stigma among Latino graduate students was predicted by several variables.

Selected References
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EXPLORING HUMILITY IN ENGINEERING STUDENTS: PERSPECTIVES FROM ANALYSIS OF INTERVIEWS

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Presentation Context

Research Strategy → Mixed Method Research Design → Survey measuring IH and RC → Semi-structured interview

Research question: How do engineering students conceptualize and value intellectual humility?

Purpose: Present qualitative results on intellectual humility and resistance to change through resulting themes and categories.

Introduction

Abstract:
- Existing research shows that intellectual humility (IH) is positively associated with academic performance in post-secondary education (Wong & Wong, 2021).
- IH has direct influence on how individuals process new information, remain open, change their conceptual understanding, and learn new competencies (Samuelson et al., 2015).
- Prior research in engineering has shown that undergraduate students carry high levels of cognitive rigidity and of emotional attachment to their own ideas (Dyehouse et al., 2015).

Student Demographics

Methodology

• A semi-structured interview protocol was employed to ask questions derived from theoretical constructs in the literature on intellectual humility and resistance to change.
• At the end of a survey, participants were asked if they wanted to participate in a follow-up interview. The interview study is based on 25 interviews.
• We followed an iterative process of open and axial coding followed by interrater reliability checks producing commonalities and divergences.
• For the analysis of the range of conceptualizations, the research team chose a phenomenographic approach (Akerlind, 2008).
• For eliciting commonalities, the research team utilized phenomenological research approaches (Vagle, 2018).

Results: Intellectual Humility

(a) Definitions and conceptualizations of humility,
Anti-definitions:
Not bragging (Angel, Pos. 159); Not attaching yourself to your idea (Nathan, Pos. 100); not thinking like you’re better than someone (Wesley, Pos. 281); not trying to put someone else’s opinion or perspective down (Fatima, Pos. 97); snobby (Andrew, Pos. 145); absence of intellectual pomposness (Ben, Pos. 101); not comparing yourself to anyone (Angel, Pos. 163).

(b) Students’ personal values of humility and the value placed on humility by universities as experienced by engineering students,

"I would love for me to be intellectually humble. And that is the way that I would want for myself to be as" (Sean, Pos. 113).

And the organization, they’re going to be there for years, if they say the entire time. So how they act is more important. And also, you’re more rewarded within there for years, if they say the entire time. So how they act is more important. And also, you’re more rewarded within an organization rather than in a classroom (Ryan, Pos. 85).

(c) Observable characteristics and personality traits of intellectually humble peers and faculty.

(d) The perceived value of humility in the profession students prepare for,

Results: Resistance to change

Routine seeking:
• Instant feelings of frustration and annoyance.
• Students’ carry a busy schedule
• Students’ belief about their role as students

[Assignments] just comes with it. That’s just part of the coursework (Marcus, Pos. 221).

Time management

Yeah, personally, yes, it is very hard. I live on plans. I have a plan to do today. I have planned what to do tomorrow. I have planned what to do next week. It’s already there (Ahmed, Pos. 169).

(b) Emotional reaction to imposed change:
• Students will still follow new instructions even though they reacted negatively to sudden change.

‘So I would figure out a way to make it work, even if it wouldn’t necessarily be something I’d be super happy about’ (Wesley, Pos. 157).

• Students react negatively to sudden changes
• Student and professor relationship

I would like ask my classmates about it. And if my classmates who are complaining then I would ask that we all like, talk to the like teacher or professor about like an extension on the due date (Angel, Pos. 235).

(c) Cognitive rigidity

• Closed-mindedness and lack of will to adjust to new situations.
• Students react negatively to sudden changes. They look for certainty which becomes a depending factor.
• The reason students change their mind is related to knowledge.

Final insights

• Intellectual humility (IH) can be seen as a skill the aids students process new information.
• Engineering students see resistance to change as a lack of IH, when students are not open to new ideas, suggestions, and peers’ opinions.
• College can play an important role in creating spaces where students can excel in IH.

References


(Diyaut, 2019). Intellectual humility: A phenomenographic approach to understanding intellectual humility and how it can be promoted in the classroom. Teaching in Higher Education, 24(2), 155-156.

Abstract of the article: Intellectual humility is defined as the recognition and appreciation of the limits of one’s own knowledge and the willingness to engage with others in a way that promotes mutual learning and growth. This approach emphasizes the importance of intellectual humility in fostering a collaborative learning environment, where students are encouraged to reflect on their own biases and assumptions. The study aims to explore the nature of intellectual humility and its implications for teaching and learning. The findings highlight the potential of intellectual humility as a tool for enhancing student engagement and promoting academic growth.

TO PREVIEW THE PRINT QUALITY OF THIS POSTER...
Becoming a Bilingual Teacher on the Border: Developing Ideological Clarity at a Hispanic-Serving Institution

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Overview
This qualitative case study sought to understand the opportunities that bilingual preservice teachers (PSTs) at a border city Hispanic-Serving Institution (HSI) have to develop linguistic ideological clarity during their time in a teacher education program, as well as the ways their own linguistic histories might interact with the ideologies in circulation and development within the program. Findings included PSTs reframing their bilingualism through a heteroglossic lens; conceptualizing “success” in linguistic terms; and specific pedagogies within teacher education that provided opportunities for the development of ideological clarity.

Data Analysis:
- Multiple rounds of open and focused coding to move from codes to categories to themes (Saldana, 2016)

Context:
- Border city Hispanic Serving Institution (HSI)
- Majority of PSTs grow up in the borderland context and return to teach in schools in the same community (Sisk et al., 2007)
- First semester in which introductory BED course was promoted as Spanish for bilingual certification PSTs

Methodology
Participants:
- 4 PST teacher residents
- 6 PSTs enrolled in introductory BED course
- 1 instructor of introductory BED course

Data Sources:
- 22 interviews
- 30 hours observations in BED course
- 92 samples of course artifacts

Background
U.S. classrooms are growing increasingly more diverse. Language ideologies: Systems of beliefs about languages and those who use languages in different ways and social contexts (Wooldrige, 1998).
- Ideological clarity: Ongoing process through which individuals can critically consider their ideological orientations as well as dominant ideologies that favor those in power, with an aim of becoming agents of change (Alfaro & Bartolomé, 2017).
- Dynamic bilingualism: Accounts for the ways in which languages are socially constructed and posits that the languages of bilinguals exist in a single linguistic repertoire (García, 2009). This conceptualization is particularly important to the borderland context of this study.

Pedagogies for developing ideological clarity
The instructor of an introductory BED course used 3 centering practices to ground course content and help students consider topics from a critical perspective. These practices included the following:
- helping PSTs historicize their own identities and experiences as well as those of multilingual students in general
- encouraging PSTs to interrogate the power at work in policies, perspectives, and experiences
- providing opportunities for PSTs to engage in praxis through critical reflection and application

Discussion and Implications
- Importance of providing PSTs with opportunities to reflect on linguistic histories as an integral part of the process of developing ideological clarity
- Teacher education programs preparing bilingual PSTs to take the BTLPT: Practical and ideological preparation is necessary. From a wider lens, it is important for policy-makers to be aware of the longer-term effects of K-12 standardized testing with a goal of exiting students from bilingual education, which may unintentionally push future bilingual PSTs out of the pipeline.
- Developing ideological clarity is a process, not an endpoint. The instructor also used libres acompañantes as a platform to connect theoretical content to practical application.
- These critical multilingual children’s books provided PSTs with platforms through which to notice and name the ideologies at work in their own histories and in educational settings, and move towards reflecting on and applying new understandings in practice.

References
- García, O. (2009). Dynamic bilingualism: Accounts for the ways in which languages are socially constructed and posits that the languages of bilinguals exist in a single linguistic repertoire. (10), 1225-1237.
Spatial reasoning is critical to mathematics and STEM learning. Early childhood educators are rarely prepared to teach its comprising skills.

**Background**

Little research has been done to investigate how early childhood educators (ECEs) teach spatial reasoning (SR) through mathematics. This scoping review describes what is known about ECEs teaching or learning to teach SR by synthesizing extant literature related to teachers’ professional development, their tools, and their knowledge and beliefs about teaching SR. Situated learning theory and sociocultural theories of learning informed the alignment of the literature to factors within an adapted model of teacher professional growth, in which components are conjectured to relate to teaching practices. Results indicate that ECEs’ SR knowledge is researched most frequently, while few studies illustrate what SR teaching practices look like in the early grades.

**Methods**

Systematic Review of Extant Literature

- **Studies included**: 76 studies
- **Studies excluded**: 16 studies
- **Studies evaluated**: 60 studies


References available upon request

**Extra results**

This paper contributes to mathematics education research as evidence that we currently know little about how ECEs teach and learn to teach SR through mathematics. These findings support earlier claims that SR is not taught with the necessary emphasis (Clements & Sarama, 2011) and illuminate gaps in the extant research related to PD, tools, knowledge, and beliefs. Future research directions include spatializing early mathematics curricula, developing PD for ECEs to engage in collaborative situated learning, and enhancing ECEs’ SR teaching practices by developing positive mathematical identities.

SR should be taught in early grades classrooms, but numeracy instruction continues to dominate young children’s learning opportunities (Bruce et al., 2012; Clements & Sarama, 2011; Copley, 2010). This syntheses indicates that we know little about what SR instruction looks like and therefore need to learn how SR is currently understood and taught by ECEs to develop ways to spatialize early mathematics teaching practices. Sharing these findings will facilitate researchers in articulating their impetus to develop curricula and PD to enhance SR instruction.
# Transfronterizo Families’ Languages Policies at the U.S.-México Border

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## Introduction

Many Latinx and immigrant families know that to navigate in this country, their children need to learn English even though they also want them to maintain their heritage language (HL). This research is a qualitative, multiple-case study, that looks at the decisions parents make about their language use at home. Particularly, it focuses on the language practices at home of transfronterizo families, those families who are frequent border crossers. This research is currently in the data collection stage.

## Background

Many language minority parents in the U.S. view bilingualism as a family goal and aim to provide their children with the opportunity to learn a second language at a young age (King & Fogle, 2006). Schools in the U.S. have a deficit way of thinking which views minority students and their families at fault for poor academic performance, which claims that students enter school without cultural knowledge and skills and that parents do not value or support their children’s education (Yosso, 2005).

The exploration of the language use and decision-making practices taken by Latinx, and immigrant parents can be explained by the understanding of the development of family language policy (FLP) which is seen as an action taken by parents to provide support for children’s HL maintenance and development. However, the support that parents provide for their children, is not viewed as a contribution to what happens in the classroom. FLP is shaped by what the family believes will strengthen the family’s language goals (Curdt-Christiansen, 2009). Soltero-González and Reyes (2012) emphasizes the importance of building on the language and cultural resources children bring from home into the classroom to support English language and literacy development.

Looking at FLP is significant for the Latinx and immigrant student population, as is the practice that centers around what the family believes is better for their children’s language acquisition and practices when it comes to learning a second language. There is research on the FLP of immigrant children in the U.S. schools, however, it is not particularly focused on the FLP of transfronterizo children on the border.

## Significance

I want this research to bring light to the language policies that happen within the homes of transfronterizo families when it comes to their children’s upbringing and how those policies are connected to their experiences as transfronterizo families living in the U.S-Mexico border.

I expect through this research, to inform policymakers and educators, about the language practices already in place in transfronterizo homes to better understand and utilize this information towards improving the instruction and classroom experiences of transfronterizo students. Potentially, this research could bridge the communication gap between transfronterizo parents, educators, and school administrators.

## Research Questions

1. **How do transfronterizxs families describe their family language policies (FLP) at the U.S. Mexican borders?**
   a) How are families talk about their language practices in the home?
   b) What language ideologies circulate within the family?
   c) How are families managing language use within the home?

2. **How is FLP connected to their experiences?**
   b) How are families’ FLPs connected to (influence/influenced by) children’s schools?
   c) How is FLP connected to (influence/influenced by) histories of language use and ideologies in the family?
   d) How is FLP connected to (influence/influenced by) the border context and contact with multiple cultures?

## Methodology

- Multiple-case study.
- Three-part, in-depth interviews (Seidman, 2006).
- Video record family interactions while focusing on their language use. Video recordings are those that happen regularly and routinely for the families.

## Participant Characteristics

Participants for this study are families that meet the following characteristics:

- Parents to at least one elementary aged child who attends a public-school dual language program in the El Paso area.
- To live in the El Paso area.
- Have been born either in México or in the United States.
- Have Mexican parents.
- Have been raised in México during part of their childhood.
- Cross the border often.

## Theoretical Frameworks

- **Family language policy (FLP)** as a framework to examine and understand the language policy and decisions behind what happens in the homes of transfronterizo families to achieve the desired bilingualism of the parents. It provides a lens that allows to examine the linguistic practices at home while examining the participants’ perceptions of their language policy regarding their beliefs, management, and practices.
- King and Fogle (2013) describe FLP as a policy that considers what families do with language in day-to-day interactions, their beliefs and ideologies about language and its use, and their goals and efforts to shape language use and learning outcomes.
- **Borderlands theory** can provide a lens to understand the perceptions of transfronterizo participants who live in between two countries, navigate two social systems, two cultures, and who speak and maintain two languages. It provides a particular lens to the study of transfronterizo families’ language policies emerging from two spaces.
- Anzaldúa (1987) establishes the border between the U.S. and México, as a metaphor for all types of crossings necessary to exist in multiple linguistic and cultural contexts.

## References


Yosso, T. J. (2005). Whose culture has capital? A critical race theory discussion of family language policy (FLP) as a framework to examine and understand the language policy and decisions behind what happens in the homes of transfronterizo families to achieve the desired bilingualism of the parents. It provides a lens that allows to examine the linguistic practices at home while examining the participants’ perceptions of their language policy regarding their beliefs, management, and practices.

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## Methodology

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- Three-part, in-depth interviews (Seidman, 2006).
- Video record family interactions while focusing on their language use. Video recordings are those that happen regularly and routinely for the families.
Overview
The Sol y Agua research-practice partnership between UTEP and the El Paso Independent School District aims to increase the number of Latinx students, emergent bilingual learners, and girls participating in computer science (CS) education through integration of computational thinking (Grover & Pea, 2013) into middle school content-area instruction, culturally responsive and translanguaging pedagogies, and co-designed lesson modules using the Sol y Agua game, a bilingual and culturally responsive video game designed by UTEP CS students to resonate with borderland K-12 students’ lived experiences. Over 4 years, the Sol y Agua team collaboratively designed and piloted bilingual, culturally responsive lessons for middle school math, social studies, and English language arts classrooms. The project brings together scholarship in bilingual education and computer science education and draws on the bilingual and bicultural knowledge of team members and EPISD students to design computational thinking lessons centered on the US-Mexico borderland experience.

Methodology
In this four-year study (October 2020-September 2023), ethnographic methods were used for data collection and analysis (Corbin & Strauss, 2014), resulting in over 70 hours of collaborative curriculum development work conducted both in-person and virtually; 37 hours of videorecorded classroom interaction; interviews with each participating teacher in 2020, 2021, and 2023; artifacts that included virtual whiteboards, draft lesson plans, and classroom handouts; and in-game usage data. Analysis included thematic coding of video and interview transcripts and artifacts using NVivo software.

Findings
Across three years of curriculum development, teachers demonstrated knowledge of computational thinking and translanguaging and culturally responsive pedagogies. In lessons piloted, teachers and students engaged in computational thinking in the context of math, social studies, and English language arts. However, CT was mostly implicit and not usually discussed explicitly. Bringing this finding to the team, we discussed ways to make CT more explicit in revised versions of the lesson plans, as well as factors that would support more explicit treatment of CT in content-area instruction (e.g., examples of specific CT-focused instructional activities).

Products
The Sol y Agua project integrated computational thinking (CT) into middle school curricula through the development and deployment of a culturally responsive educational game. This was achieved by:
- Collaborating across disciplines, involving teachers, researchers, and students in curriculum development.
- Utilizing the Sol y Agua game to introduce CT concepts within a context familiar to students, emphasizing problem-solving, abstraction, and algorithms.
- Incorporating translanguaging and culturally responsive pedagogies to enhance engagement and learning into the planning lessons/PBLs.
- Conducting iterative design and feedback sessions to refine game features and pedagogical strategies, ensuring the game supported bilingual use and aligned with educational standards.

Products include:
- 5 publicly-available bilingual lesson plans/project-based learning modules and materials for all teachers in the borderland region.
- Refinement of the Sol y Agua video game, incorporating feedback from teacher and student participants, and shifting to web-based play.

Significance
The Sol y Agua RPP:
- Addresses underrepresentation of Latinx in computing/STEM through culturally relevant middle school curriculum.
- Introduces computational thinking using innovative bilingual game reflecting local borderland environment and culture.
- Emphasizes assets-based pedagogy leveraging translanguaging and students’ funds of knowledge.
- Provides research insights into linguistically-diverse students’ computational participation for CS education.
- Models equitable knowledge co-creation between universities and communities to meet educational needs.
- Disrupts deficit narratives about minoritized students’ capabilities by demonstrating computational strengths.

Acknowledgements
This material is based upon work supported by the National Science Foundation under Grants #1923599 and #1923586. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

This project has also been generously supported by the Hopper-Dean Center of Excellence for K-12 Computer Science Education at UTEP.
Exploring the Impact of STEM Degree Attainment on Social Mobility among Latinx Students at a Texas/Mexican Border University: A Work in Progress.

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Introduction and Background
This study aims to explore the impact of STEM degree attainment on Social Mobility among Latinx students in a Texas/Mexican border university.

- Some studies have been conducted on this topic; however, the specificity of Latinx higher education in STEM on the Texas-Mexico border has yet to be investigated.

- Social mobility is defined as a change in a person’s socioeconomic status throughout their lifetime (intra-generational mobility).

- Latinx, a term fostering gender inclusivity, designates individuals of Latin American heritage living in the United States, serving as a gender-neutral alternative, acknowledging the diversity of gender identities within this community.

- The U.S.-Mexico border in Texas spans around 1,248 miles, extending from El Paso to Brownsville in the south. This region is characterized by a population where over 80% identify as Hispanic (Fig. 1).

- The relevance of this research addresses the need to expand and increase the ways to measure and assess higher education’s social impact on the growing Latinx population. One of the goals is to better inform societal decisions and contribute to the evolution and diversification of policy-making in education.

Research Question(s)
The research question we look to respond to is: How does attaining a STEM degree influence intragenerational social mobility for Latinx students in a University on the Texas/Mexico border?

- Several studies based their research on intergenerational social mobility; this one will approach the issue through an intragenerational lens.

- This intragenerational approach will be more accurate as we compare the same individual through time rather than using datasets.

- The expected results are that the attainment of a STEM degree will impact the participants’ socioeconomic status (SES) as they move upward in the social mobility ladder, compared with a non-STEM degree graduate.

- STEM degree attainment has been recognized as a factor in the upward social mobility of the general population.

- This research will focus on the impact of the specific Latinx population on the Texas-Mexico border.

Expected Results

- • The expected results are that the attainment of a STEM degree will impact the participants’ socioeconomic status (SES) as they move upward in the social mobility ladder, compared with a non-STEM degree graduate.

- STEM degree attainment has been recognized as a factor in the upward social mobility of the general population.

- This research will focus on the impact of the specific Latinx population on the Texas-Mexico border.

- Median wage and salary earnings of the workforce ages 18–74 in STEM and non-STEM occupations, by sex, ethnicity, race, and disability status: 2020


Project Methodology
Participants will complete surveys and questionnaires, and later, individual interviews and focus groups will take place to validate the quantitative results.

- This research will do a two-phased explanatory sequential mixed methods study to obtain quantitative data and then explain the quantitative results with in-depth qualitative data. Triangulation will happen throughout the study.

- • In the first phase of the study, statistical quantitative results data will be collected from a sample through a survey and followed up with the qualitative data provided from individual interviews to explain initial results in more depth.

- • The strategy used to gather participants is purposeful homogenous sampling. This research method selects a sample with specific, similar characteristics or traits within a population.

- • The participants in this study will be self-identified Latinx or Hispanic students (current or previous) at the University of Texas at El Paso.

- • Surveys will be administered to 40 to 50 participants. This number was decided based on having a confidence level of 95%, with a desired margin of error of 15% (Sauro & Lewis, 2016). The data will be collected starting in the fall semester of 2024.

- • The LatCrit theoretical framework will inform the development and interpretation of the research.


Project Significance
This study will contribute to the body of knowledge, adding the specificity of the impact of obtaining a STEM degree on Latinx students and their social mobility, which appears as a gap in the current literature, considering that the Latino/Hispanic population along the Rio Grande border has the largest concentration.


Top Ten U.S. Colleges for Upward Mobility

<table>
<thead>
<tr>
<th>College or University</th>
<th>Location</th>
<th>Undergraduate Enrollment</th>
<th>Percent 20%-Top 20% Family Income</th>
<th>Mobility Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>California State University, Los Angeles</td>
<td>Los Angeles, CA</td>
<td>23,082</td>
<td>5.9%</td>
<td>10%</td>
</tr>
<tr>
<td>Pace University</td>
<td>New York, NY</td>
<td>9,840</td>
<td>9.4%</td>
<td>10%</td>
</tr>
<tr>
<td>State University of New York at Stony Brook</td>
<td>Long Island, NY</td>
<td>17,822</td>
<td>8.4%</td>
<td>10%</td>
</tr>
<tr>
<td>University of Texas Rio Grande Valley</td>
<td>Rio Grande Valley, TX</td>
<td>24,978</td>
<td>7.6%</td>
<td>10%</td>
</tr>
<tr>
<td>City University of New York</td>
<td>New York, NY</td>
<td>246,951</td>
<td>7.2%</td>
<td>10%</td>
</tr>
<tr>
<td>Galveston Community College</td>
<td>Galveston, TX</td>
<td>13,176</td>
<td>7.1%</td>
<td>10%</td>
</tr>
<tr>
<td>South Texas College</td>
<td>McAllen, TX</td>
<td>31,321</td>
<td>9.9%</td>
<td>10%</td>
</tr>
<tr>
<td>El Paso Community College</td>
<td>El Paso, TX</td>
<td>25,151</td>
<td>6.6%</td>
<td>10%</td>
</tr>
<tr>
<td>St. John’s University</td>
<td>Queens, NY</td>
<td>14,766</td>
<td>6.6%</td>
<td>10%</td>
</tr>
</tbody>
</table>

The population of U.S.-born Latinas is projected to grow by ten percentage points by 2060.

Acknowledgments
SUPPORT: This material is based upon work supported by the National Science Foundation, award HRD-1826745, as part of the UT System LSAMP Program.

DISCLAIMER: Any opinions, findings, conclusions, or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.
Overview

- The goal of this study is to investigate an engineering education model that can help to transform first-year engineering students and impact their career preparedness, academic motivation, time management, communication skills, and other professional competencies.
- Investigate the importance of peer-to-peer mentorship programs, specifically focusing on utilizing the course teaching assistants as role models and mentors.
- The implementation of a peer mentoring component is necessary to facilitate a more inclusive learning environment.
- Without forgetting the importance of the fundamental technical content of an introductory course, regardless of academic major, play a significant role in shaping the future engineers.
- Introductory courses, regardless of academic major, play a significant role in solidifying the career preparedness, academic motivation, persistence, and foundational professional skills of undergraduate students to satisfactorily navigate their academic programs and professional careers.
- The implementation of a peer mentoring component is necessary to facilitate a support system for first-year freshman engineering students.
- The Center for Research in Engineering and Technology, in collaboration with the Engineering Leadership and Innovation department, is spearheading this research initiative.

Methodology

The Center for Research in Engineering and Technology, in collaboration with the Engineering Leadership and Innovation department, is spearheading this research initiative. The execution of the research follows a circular model to ensure the information given to the students is relevant. The graphic below provides an overview of the methodology used to facilitate this research initiative.

Professional Competency Workshop

We aligned the workshop content to enhance the traditional engineering content presented in the course while not compromising the curriculum. The table below provides an overview of each workshop, including descriptions and key concepts.

<table>
<thead>
<tr>
<th>Workshop</th>
<th>Description</th>
<th>Key Concepts</th>
</tr>
</thead>
</table>
| Communications | This workshop addresses the need for engineers to be able to communicate complex thoughts and ideas to diverse stakeholders and customers. | • Effective Communication  
• Conflict Management  
• Team Collaboration  
• Professional Presentation Skills  
• Cultural Communication  
• Effective Listening  
• Building Tailored Messages  
• Feedback and Improvement |
| Resume Writing | This workshop highlights the need to develop a resume that fits the industry expectations while also standing out to employers, scholarship boards, and other resume reviewers. | • Tailoring resumes for specific jobs  
• Format and Structure  
• Action Verbs  
• Professional Experience  
• Resume Review and Editing  
• Personal Brand in Resumes  
• Aligning an Employer Expectations  
• Continuous Improvement |
| Motivation and Time Management | This workshop focuses on identifying students' various motivation styles and providing strategies to turn these styles into time management practices that are meaningful for the student. | • Understanding Motivation  
• Effective Goal Setting  
• Proactive Time Management  
• Mindfulness in Time Management  
• Integration of Motivation into Daily Habits  
• Utilizing Technology to Stay Accountable  
• Positive Habits  
• Real-World Application |
| Get Involved on Campus | This workshop encourages students to get involved and engaged with student organizations, emphasizing the importance of extracurricular involvement to support their transition into the professional world. | • Benefits of Student Involvement  
• Identifying Student Organizations  
• Networking  
• Leadership Opportunities  
• Community Service  
• Unique Resources Access |

Results

To assess the impact of the professional competency workshops on students, a survey was given where students rated their confidence in applying workshop-learned skills across various scenarios. Utilizing a 5-point rating scale ranging from “Not Skilled at All” to “Extremely Skilled,” we measured changes in confidence level before and after the course. The table below shows the average percentage increase in students’ confidence levels for each respective workshop and the skills surveyed.

<table>
<thead>
<tr>
<th>Workshop</th>
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• Networking  
• Leadership Opportunities  
• Community Service  
• Unique Resources Access |

Prior to the course, 95% of students were not involved on campus, with 39% of these students expressing a desire to get involved. After the course, 63% of students remained uninvolved, but 97% of these students expressed an interest in campus involvement. Additionally, only 53% of students had resumes prior to the course. After that, the number increased to 98% of students with resumes.

To evaluate the impact of the peer mentorship aspect of the program, students were surveyed regarding their interactions with their mentors. Students rated their mentors on a variety of mentoring skills and techniques. Utilizing a 5-point scale ranging from “Not Skilled at All” to “Extremely Skilled” (7), the average rating across the skills techniques was 5.86, indicating a high level of satisfaction and perceived effectiveness in mentor performance.

Future Work

Moving forward, the data collection process will need to assess the student’s understanding of the material and specific areas in which it is most beneficial. Additional data is needed regarding the teaching assistants and professors to determine if the additional responsibilities impacted the traditional teaching assistant duties. More data will be collected and assessed with the current state of this research project to evaluate the initial impact of the program to inform future iterations.

References

EmpowerED for Success: Latinas in Engineering

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mvdbogaard@utep.edu, dgolding@utep.edu

Introduction

Work Integrated Learning (WIL), e.g. co-ops and internships, can play an instrumental role in helping Latinas transition from college to industry. However, such experiences can be very challenging for Latinas as they encounter a culture that is often white, and male dominated, and not inclusive for women and minority students.

There is a growing body of literature on the experiences of women and minoritized students in STEM (Seymour & Hunter, 2019) and on Latinas in STEM (Mein et al., 2020; Villa et al., 2020), however, the body of literature on Latinas in WIL experiences in the STEM space, and in particular in the engineering space, is very limited (Kim et al., 2020; Paull et al., 2019).

In this project we explore the experiences of Latina engineering students with Work Integrated Learning, where we specifically focus on how these students experience industry work culture.

By learning more about these experiences we can work on preparing these students better for industry, and to find ways to support industry to make these engineers feel like they are valued.

Significance

- Latinas are the fastest growing minority group in engineering education.
- WIL experiences are a relative safe environment to learn to negotiate engineering workplace culture: undergraduate students industry placements are relatively short, students come back to a known environment, and they are not yet fully dependent on a job in industry. This is an opportune time to support students in processing their experiences and supporting them further.

Theoretical frameworks

Illeris’ Theory of Learning


Hofstede Framework for Dimensions of Organizational Culture

Source: Minkov & Kaasa, 2022; www.Hofstede-insights.com

Relevance

- Five years after graduation over half of the women engineers have left the engineering profession, and after 10 years only 26% still work as an engineer.
- Reasons for leaving engineering pertain to: changing interests, family responsibilities, uncomfortable work climates, and unfavorable work conditions (Fouda et al., 2017).
- Female engineers suffer from from poor integration between industry experiences and the university environment, yet also “from systemic prejudices, including biases about [minority] students’ motivations, capabilities and discretionary power and detracting workplace cultures including those which are discriminatory” (Paul et al., 2019, page 4).
- Women who persist in the engineering workforce and women who leave “do not differ in three domains of self-confidence or outcome expectations, in vocational interests, or in workplace barriers. Women who continue in engineering do differ from those who leave in their experience of workplace supports …” (Fouda et al., 2016, page 79).
- By finding ways to support Latina engineers to create workplace supports, and by finding ways to create awareness in industry, we aim to contribute to retaining Latina engineers in the engineering workforce.

Methodology

Research questions

1. What are the unique experiences that Latinas face in undergraduate WIL experiences?
2. How does Latin cultural influence Latina success in undergraduate WIL experiences?
3. What supports, mentoring, and/or interventions can effectively help Latinas towards successful undergraduate WIL experiences?

Research design

- A qualitative study
- Individual interviews with 20 and 30 Latina engineering students with some level of WIL experience.
- Freshmen, Sophomore, Junior and Senior students.
- We will use thematic analysis that is based on both a deductive approach (Illeris’ Model and Hofstede’s cultural dimensions) and an inductive approach that is based on the data.

Literature


Acknowledgements

This project is partly funded by the COED Office of Research Support through their VentureFund initiative.
High School Students’ Career Choices Shaped Through Science Internships

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Teacher Education Department, College of Education, The University of Texas at El Paso

Introduction

- A diverse and proficient STEM workforce is essential for propelling future innovations and bolstering the economy (Committee on STEM Education, 2018). A 2019 report, by the National Association of Manufacturing and consulting firm Deloitte, predicted that while the U.S. will create 3.5 million STEM jobs by 2025, approximately 2 million jobs will go unfilled due to a lack of skilled workers (Birney & McNamara, 2021; Roehrig et al., 2021).
- High school experiences play a significant role in shaping future STEM outcomes in higher education and the workforce (Rosenzweig & Chen, 2023; Wang, 2013). Despite the recognized significance of high school science internship, the current body of research is notably deficient in exploring their specific influence on directing students toward STEM fields (Rice, 2018).
- Research question: How might high school students’ career choices be shaped by science internships?

Theoretical Framework

- Social Cognitive Career Theory (SCCT) explores the interplay of psychological and social factors that influence personal interests and guide decisions in educational and career paths (Lent, Brown, and Hackett, 1994) and primarily stems from Bandura’s general Social Cognitive Theory (1986).
- Self-efficacy expectations represent people’s beliefs in their capabilities to enact behaviors to succeed in different activity domains and are responsive to four major sources of information: mastery experiences, vicarious experiences, verbal persuasion, and physiological and affective states.
- Outcome expectations focus on the perceived consequences of activity engagement in different performance domains and can be material, social or self-evaluative.

Research Methods

- Research Context
  - Work With A Scientist Program funded by National Science Foundation
  - UTEP College of Education managed the program
  - UTEP Environmental Health & Safety Office conducted safety training
  - School district central office provided support and resources
  - 3 local Title 1 high schools actively participated
  - 7-month internships (10 Saturdays in Spring and 30 days in summer)
  - 108 high school students from Title 1 schools

- Data Sources and Analysis
  - Data Sources: 88 follow-up student interviews
  - Analysis:
    - Thematic analysis (Braun & Clarke, 2021)
    - Intercoder agreement (Campbell et al., 2013)
      - Kappa=.879 for analysis on student career choice changes
      - Kappa=.816 for analysis on their career choice change reasoning

Data Analysis Results

<table>
<thead>
<tr>
<th>Table 1. Changes of High School Students’ Career Choices Shaped by Science Internships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category/Sub-Category</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Self-efficacy expectations</td>
</tr>
<tr>
<td>Outcome expectations</td>
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<tr>
<td>Outcome expectations</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2. Reasons of Students’ Career Choice Changes from the SCCT Perspective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category/Sub-Category</td>
</tr>
<tr>
<td>------------------------</td>
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<td></td>
</tr>
</tbody>
</table>

Major Findings

- Five categories and eight sub-categories of career choice changes were identified.
- A majority (94.32%) of high school students affirmed that these science internships changed their career choices through either enhancing (35.23%), expanding (45.45%), narrowing down (4.55%), or replacing (9.09%) their career choices.

Reasonings of Students’ Career Choice Changes from the SCCT Perspective

- Two categories and seven sub-categories of reasons of students’ career choice changes were identified.
- High school students attributed their new career choice changes mostly based on the category of self-efficacy expectations (87.5%), rather than the category of outcome expectations (12.5%).
- Notably, science internships particularly helped students understand their physiological and affective states (56.82%) towards STEM fields.

Implications

- Internship Design: This study emphasizes the importance of science internships in helping students understand their physiological and affective states towards STEM fields. Future science internships can be designed to enhance other dimensions of self-efficacy expectations to guide students to STEM fields.
- Career Counseling: Career counselors in schools can utilize this study’s findings as a resource to effectively communicate the potential benefits of science internships. These insights can help students understand how internships can shape their career paths in STEM fields and empower them to make informed decisions.
- Educational Policy: Given the fact that the majority of students’ career choices was shaped by the science internships, educators might consider integrating such internships into science education to steer more students towards STEM fields, meeting the demand for STEM professionals.
- Further Research: The finding in this qualitative research can potentially serve as a foundation to design instruments to better understand the impacts of science internships on students’ career choices quantitatively.

Acknowledgements

Data Analysis: [Data Analysis sidebar with details]

Thematic analysis: [Thematic analysis sidebar with details]
The effect of a STEM integrated curriculum on design thinking dispositions in middle school students: A mixed methods study

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dthomason@mines.utep.edu & phau@utep.edu

Introduction

- Due to a continued lack of qualified STEM (Science, Technology Engineering and Mathematics) personnel to meet the demands of an increasingly technological workplace, K-12 schools are incorporating STEM activities and curriculum beginning in early childhood education and continuing throughout the middle and high school years.
- A STEM integrated curriculum uses the engineering design process to promote problem solving and critical thinking skills while relying on the use of disciplinary knowledge learned in math and science classes.
- The engineering design process supports design thinking and is viewed as having the potential to address social, political, economic, and technological issues (Koh et al., 2015).
- Design thinking processes use creativity and collaboration to solve problems that are human-centered and design thinking is viewed as an essential skill in the modern workplace (Li & Zhan, 2022).
- Understanding how STEM in schools impacts students and specifically how STEM can develop design thinking is critical to understanding how resources can best be used.

This mixed methods study addressed the following research questions:

- What is the impact of an integrated STEM curriculum in developing design thinking dispositions in middle school students?
- What are the perceptions of students and teachers on how a STEM integrated curriculum helps to develop design thinking dispositions?

Research Methods

This study followed an explanatory sequential mixed methods study design.

- Quantitative data was collected from seventh grade students through using the Design Thinking Disposition Survey. Sevent grades from both a STEM and non-STEM school received a pre and post survey at the beginning and end of the semester.
- Qualitative data was collected from free response questions on the survey and from student and teacher interviews at the STEM school. Qualitative data was collected to show how design thinking differs after students have been a part of a STEM integrated curriculum program.

Results

Quantitative Results

<table>
<thead>
<tr>
<th>Define</th>
<th>School</th>
<th>Pretest</th>
<th>Posttest</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEM</td>
<td>3.55</td>
<td>3.82</td>
<td></td>
</tr>
<tr>
<td>NonSTEM</td>
<td>3.46</td>
<td>3.67</td>
<td></td>
</tr>
<tr>
<td>Empathize</td>
<td>STEM</td>
<td>3.47</td>
<td>3.52</td>
</tr>
<tr>
<td>NonSTEM</td>
<td>3.14</td>
<td>3.48</td>
<td></td>
</tr>
<tr>
<td>Ideate</td>
<td>STEM</td>
<td>3.47</td>
<td>3.52</td>
</tr>
<tr>
<td>NonSTEM</td>
<td>3.14</td>
<td>3.38</td>
<td></td>
</tr>
<tr>
<td>Prototype</td>
<td>STEM</td>
<td>3.02</td>
<td>3.21</td>
</tr>
<tr>
<td>NonSTEM</td>
<td>2.92</td>
<td>2.91</td>
<td></td>
</tr>
</tbody>
</table>

Seventh Graders showed no significant differences between the STEM and nonSTEM school in changes in each of the four areas of design thinking dispositions tested. P values for each area were as follows:
- Define: 0.58, Empathize: 0.99, Ideate: 0.84, Prototype: 0.20

Free response questions included yes or no questions on if students thought they were better at problem solving or designing solutions at the end of the year than at the beginning. Students were also surveyed on whether they were interested in pursuing a STEM career. Students from the STEM school had a statistically significant difference in their perceived ability to design solutions p<0.05.

Qualitative Results

- Seventeen seventh grade students and three teachers from the STEM school participated in semi-structured interviews. Questions related to what they enjoyed about their STEM class, how they went about designing solutions to problems and what careers they were interested in pursuing.
- Both teacher and student interviews were coded by two researchers until an interrater reliability of 88% was achieved. All thirteen students mentioned the codes “finding a solution,” “collaboration,” and “hands-on” in their interviews. Additional identified codes included “satisfaction,” “job stability,” “impact on others,” and “choice.”

Final Coding Rubric – Student Interviews

<table>
<thead>
<tr>
<th>Code</th>
<th>Example</th>
<th>% of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finding a Solution</td>
<td>“Just look at the resources you have around. And if it doesn’t work just try to modify it.”</td>
<td>100%</td>
</tr>
<tr>
<td>Choice</td>
<td>“And we do whatever we want – like we get to be creative in that class.”</td>
<td>31%</td>
</tr>
<tr>
<td>Collaboration</td>
<td>“There’s more minds, to think of better ideas to help with the project.”</td>
<td>100%</td>
</tr>
<tr>
<td>Impact on others</td>
<td>“You have to think how they will use it and if it will work for that specific person.”</td>
<td>62%</td>
</tr>
<tr>
<td>Hands-On</td>
<td>“I like when we get to build things and program it.”</td>
<td>100%</td>
</tr>
<tr>
<td>Satisfaction</td>
<td>“We do a lot of stuff in there that I really enjoy.”</td>
<td>92%</td>
</tr>
<tr>
<td>Job Stability</td>
<td>“Now my parents are struggling, so I kind of want to help them.”</td>
<td>92%</td>
</tr>
</tbody>
</table>

Major Findings

- Students that think they can succeed in school are more engaged in learning, and self-efficacy in STEM is a predictor of students pursuing a career in STEM fields (Falco, 2020). STEM students showed more confidence in their design thinking abilities which can increase student engagement and a likelihood that the student will pursue STEM subjects in the future.

Implications

- Students think that they can succeed in school are more engaged in learning, and self-efficacy in STEM is a predictor of students pursuing a career in STEM fields (Falco, 2020). STEM students showed more confidence in their design thinking abilities which can increase student engagement and a likelihood that the student will pursue STEM subjects in the future.

Recommendations for practice:

- The lowest scoring domain for both schools in both pre and post testing was prototyping. The prototype dimension can be developed during design activities by developing sketching skills and teaching how to prototype (Zhou et al., 2017).
- Due to the lack of codes in the define dimension, teachers should encourage students to frame and develop narrower problem statements generate more fruitful ideas (Shanks, 2012).
- Use longitudinal data to track differences in future educational and career choices of STEM and nonSTEM students.
- Design an instrument that evaluates how students are generating and evaluating solutions through collaboration.
- Studying larger sample sizes might provide more significant differences among groups.

Participants

<table>
<thead>
<tr>
<th>School</th>
<th>STEM</th>
<th>NonSTEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student Population</td>
<td>696</td>
<td>666</td>
</tr>
<tr>
<td>% Hispanic</td>
<td>94.5</td>
<td>94.4</td>
</tr>
<tr>
<td>% ELL</td>
<td>27.3</td>
<td>37.7</td>
</tr>
</tbody>
</table>

The Instrument

The Design Thinking Disposition scale (Tsai & Wang, 2021) was developed specifically for middle-school and measures the following aspects of design thinking:
- Empathize: “I usually try to see the problem from the users’ point of view.”
- Define: “I usually try to understand the problem that must be solved.”
- Ideate: “I usually come up with new solutions.”
- Prototype: “I usually try to make a model to test it.”

The survey used a five-point Likert scale rating 1-5 from “not like me at all” to “very much like me.”

Acknowledgements

Thank you to the school district for allowing me to conduct research in their schools and to the students, teachers and administrators who were so willing to give their time to participate in this research project.
**Introduction**

**Project-Based Learning (PBL)** as a K-12 instructional model addresses a vital need for the development of 21st century skills to prepare students for success in the real-world (Bell, 2010; Condliffe et al., 2017; Sasson et al., 2018; Larmer et al., 2015). At the same time, we continue to struggle to find examples of successful school-wide implementation of PBL that allows **all** students the opportunity to benefit from this rigorous and authentic approach to instruction and learning (Kokotsaki et al., 2016). While much is known about the positive impact of PBL on student learning, the majority of empirical studies have focused on teachers with limited experience and time with PBL.

**Methodology**

- This pilot study will use a basic qualitative methodology (Merriam & Tisdell, 2016)
- Semi-structured Zoom **interviews** as the primary data collection method (Merriam & Tisdell, 2016; Seidman, 2019).
- 2-3 participants will provide one interview each, lasting approximately 60-70 minutes, and interviews will be audio-recorded and transcribed. I plan to use open coding to identify initial codes. Focused coding will be used to further analyze and theorize the codes to generate categories and or themes.

**Objectives**

There is significant research on the challenges associated with PBL implementation, however research on how teachers persist through challenges to sustain PBL over time in K-12 schools is missing. IS 289 Hudson River Middle School in NYC, NY, is a rare example of sustained PBL in a public middle school.

- **Address the gap** in our understanding of the experience of teachers who sustain PBL and persist through challenges
- **Inform practices and policies** by exploring teachers’ lived experience while sustaining PBL at IS 289 Hudson River Middle School.
- **Ultimately broaden the reach** of PBL to more students across our K-12 educational system.

**RQ:** How do teachers sustain PBL in a public middle school with a long-term, school-wide PBL program?

**Results**

In progress: Currently 2 teachers (Math and ELAR) with 20+ years experience in PBL at IS 289 have agreed to interviews scheduled for March 2024.

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**Acknowledgements**

Thank you Dr. Pei-Ling Hsu for your continued mentoring and support!
**Abstract**

Study investigates integrating data science into youth computer science education with student-centered datasets for deeper learning. Explores learning outcomes of open-ended inquiries in a two-week online workshop. Involves qualitative analysis of post-interview responses to investigate two research questions:

1. What traditional/domain knowledge in open-inquiry data science?
2. What practice affordances in computing-based data science open inquiry?

**Methodology**

Participants and Study Context

The study involved an online computer science workshop with youth ages 13 to 17, exploring data mining and analysis using Python and Twitter data. Post-workshop interviews transcripts were coded, using a mix of inductive and deductive analysis (Ravitch & Carl, 2019).

<table>
<thead>
<tr>
<th>Section of Our Curriculum</th>
<th>Coding Like a Data Miner Curriculum</th>
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<tbody>
<tr>
<td>Data Mining Phase &amp; Knowledge Practice</td>
<td>Data Gathering</td>
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<tr>
<td>Computational Thinking</td>
<td>Data Pre-processing</td>
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<td>Computational Thinking</td>
<td>Data Analysis</td>
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<td>Data Analysis</td>
<td>Data Visualization</td>
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<table>
<thead>
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<th>Coding Like a Data Miner Curriculum</th>
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<tbody>
<tr>
<td>Our Curriculum Design</td>
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<tr>
<td>Data Gathering</td>
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<td>Data Visualization</td>
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</tbody>
</table>

**Participants and Study Context**

The study involved an online computer science workshop with eight youths ages 13 to 17, exploring data mining and analysis using Python and Twitter data. Post-workshop interviews transcripts were coded, using a mix of inductive and deductive analysis (Ravitch & Carl, 2019).

**Background**

Data science drives innovation across industries and is increasingly integrated into pre-college curriculums (Lee & Wilkerson, 2018; Levitt, 2019; Rosenberg & Jones, 2022). Current data science education often restricts students to predefined inquiries and datasets, limiting authentic engagement in decision-making processes. Open inquiry in data science education emphasizes real-world applications and ethics, potentially enhancing students’ computational and domain-specific knowledge.

Pre-college data science education integrates AI and focuses on enhancing math and computing skills to develop data handling and analysis literacy in K-12 students. Culturally Relevant Computing personalizes computer science education to students’ cultural contexts, promoting equity and engagement among diverse learners (Ladson-Billings, 1995; Gay, 2018).

**Results**

Exploring Computer Science and Domain Knowledge using Open Inquiry

Diverse heuristic strategies reflect individual epistemological styles. Engaging in open inquiry with big data demonstrates computational practices and understanding of mathematical concepts.

Um, [well, I would pick a topic that] I was interested in…then I’d probably narrow down to a question or a specific area I wanted to observe, then… I would probably like to search up on the internet. And then I would gather my data. This is the step that takes me the longest part… I have to debug it and see if it works. And then make sure that I’m getting the output that is correct. (After, I’d probably like to publish it to like GitHub or something (Janet, 08/21/2023).

...And then I would mention that in the Twitter inquiry in order to get the data from Twitter, maybe I could get about 100 tweets from each search word. And then I would concatenate those three data sets so that I have one big one that I can later pre-process and the next step (Mira, 08/12/2023).

**Significance**

The study showcases open inquiry’s efficacy in enhancing youths computational and mathematical skills in real-world contexts. It emphasizes the value of blending domain knowledge and computing for scalable data science education. The research advances culturally relevant computing (CRC), advocating for inclusive and engaging learning environments in data science education.

**Acknowledgements**

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