



Seventh International Conference on Quantitative Ethnography:

CONFERENCE PROCEEDINGS SUPPLEMENT

Edited by:

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Preface

Since its establishment in 2019, the International Conference on Quantitative Ethnography (ICQE) has cultivated a vibrant and interdisciplinary scholarly community dedicated to advancing theoretical, methodological, and interpretive innovation. By integrating qualitative and quantitative approaches, ICQE has significantly contributed to the evolution of Quantitative Ethnography (QE), extending its reach across diverse domains. The 2025 edition of ICQE highlights the application of QE in fields such as healthcare, education, knowledge transfer, leadership, and social justice, employing analytical techniques including Epistemic Network Analysis and Ordered Network Analysis to examine learning processes, engagement, and systemic inequities.

The seventh ICQE convened in Mexico City (CDMX), a metropolis distinguished by its rich cultural heritage and historical significance. As the former capital of the Mexica empire and a UNESCO World Heritage site, CDMX offers a compelling backdrop for scholarly exchange. The conference was graciously hosted by two esteemed institutions of the National Autonomous University of Mexico (UNAM): the General Directorate of Computing and Information and Communication Technologies (DGTIC) and the Institute for Social Research (IIS). DGTIC exemplifies technological leadership in support of academic and administrative excellence, while IIS is renowned for its rigorous contributions to the social sciences and humanities through diverse methodological approaches.

The collaboration between DGTIC and IIS in hosting ICQE25 represents a mutually enriching endeavor. It facilitates the integration of QE methodologies into existing research paradigms at UNAM, while simultaneously enabling the global QE community to explore novel applications of quantitative analysis in qualitative research contexts.

ICQE25 received 82 submissions, each evaluated through a rigorous double-blind peer review process involving expert reviewers and meta-reviewers. The conference proceedings include accepted posters, Research Agenda Development (RAD) proposals, symposia, workshops, and doctoral consortium contributions, available via the International Society for Quantitative Ethnography (ISQE) website.

Collectively, these contributions underscore the methodological sophistication and social relevance of QE. They reflect the field's commitment to critical inquiry, inclusivity, and research leadership, while showcasing its capacity to address complex phenomena through innovative analytical frameworks.

As we commemorate seven years of ICQE and the continued growth of the International Society for Quantitative Ethnography, we extend our sincere gratitude to the National Science Foundation (NSF), ISQE, our authors, reviewers, program committee members, and the broader QE community. It is our hope that this volume will inspire further scholarly dialogue, interdisciplinary collaboration, and methodological advancement in the pursuit of meaningful and impactful research.

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Table of Contents

Preface to the ICQE25 Proceedings Supplement.....	i
---	---

Guadalupe Carmona, Cynthia Lima, María José Santos, Héctor Benítez, Luis Montero Moguel, Beatriz Galarza Tohen

Table of Contents	v
-------------------------	---

Doctoral Consortium

Students' voices on smartphones and artificial intelligence in the infrastructure for learning and social interactions in Finnish lower secondary school.....	1
---	---

Sonja Hartio

Understanding Changes in Teacher Dispositions Towards Mathematics and Mathematics Teaching.....	4
---	---

Jake Laurie

Learning from the Uncertainty: Identity Development of International Students	7
---	---

Yuna Dai

Brain Activity and User Experience Observation in Educational Game Through Epistemic and Ordered Network Analysis.....	10
--	----

Shayla Sharmin

Aspirational Constructs in <i>The Federalist</i> : Cracking the Founders' Code to Enhance Civil Discourse	14
---	----

Marguerite Williamson

Epistemic Trajectory Modeling: A Method for Modeling, Visualizing, and Comparing Learning Processes.....	19
--	----

Yuanru Tan

Research Agenda Development

Languaging and Translanguaging in Multilingual Learners' Education	22
--	----

Mariana Castro, Carrie Parker, and Jon Nordmeyer

Examining Latinx Students' Trajectories in STEM: Critical Elementary Classroom for Higher Education Success	26
---	----

Jessica Rivera, Mariana Alvidrez, Karena A. Escalante, and Minea Armijo Romero

Combining Social and Epistemic Network Analysis to study teachers' relational agency	29
--	----

Natasa Pantic

Modeling Partnership Dynamics in Early Learning: Developing a Quantitative Ethnographic Approach for Program Evaluation and Scaling.....	33
--	----

Noel Kuriakos

Artisans online. Mapping organizational change through digital ethnography.....	37
---	----

María del Rosario Vazquez Jaramillo

Workshops

Workshop: Introduction to Teaching QE	40
---	----

Ayano Ohsaki, Amalia Dache, Stephanie Rivera-Kumar, David Williamson Shaffer, Marguerite Williamson, and Amanda Barany

Posters

Are Dining Reviews Conditioned by Cuisine? An analysis of Asian vs. American Restaurants.....	45
---	----

Thao Nguyen, Yuheng Li

Paraeducator Journeys in Mathematics.....	50
---	----

Audrey Martínez-Gudapakkam, and Sabrina De Los Santos Rodríguez

In What Ways Do Different Communities Discuss Themes of Unity and Strife in the Black Community?.....	55
---	----

Michelle Bandiera, Alexander Tan, Brendan Eagan, Danielle Espino, Adaurennaya C. Onyewuenyi

An Epistemic Network Analysis of Structured Awareness-Raising Strategies Across Face-to-Face, Online and Hybrid Language Learning Contexts	60
--	----

Ward Peeters

Race on Film: Black & White Screenwriters & the Portrayal of People of Color	65
--	----

Espie Randolph III, MBA

How Independent Politicians in a Two-Party System Influence Political Framing: An Epistemic Network Analysis of Independent Australian MPs on Twitter	70
---	----

<i>Alexander Henry and Ward Peeters</i>	
Discourse Patterns in Virtual Team Conversations on Artificial Intelligence.....	75
<i>Haille Trimboli, Ph.D.</i>	
Patterns of Connection in Colonial History Amongst Different Global Regions.....	80
<i>Michelle Bandiera, Umar Khan, Cayden Shim, Ruth Akumbu, Brendan Eagan</i>	
Constructing the Ideal College Graduate: A Comparative Epistemic Network Analysis of Commencement Speeches from Leading Chinese and U.S. Universities	84
<i>Feifan Shan</i>	
Leveraging Higher Education Institutional Supports for Non-STEM International Students in the U.S. Job Market	89
<i>Tian Zhu</i>	
Code Masking: K-Partite ENA with Multi-Mode Epistemic Codes	95
<i>Zhichun Liu, Xiang Li, and Yuanru Tan</i>	
Understanding Learner Preferences: An Epistemic Network Analysis of MOOC Participation Intentions.....	100
<i>Joy Hong, Yuanru Tan, and Ji Hyun Yu</i>	
Comparing teachers' epistemic frames for supporting migrant students in Finland, Scotland and Sweden.....	105
<i>Nataša Pantić and Yizhou Fan</i>	
Conceptualizing and Quantifying the Future: Methodologies for Investigating Educational Imaginaries.....	110
<i>Morten Misfeldt, Danielle Hagood, Adrienne Traxler, Daniel Spikol, Liv Nøhr and Cecilie Carlsen Bach</i>	
Undergraduate Design Students Perception of a Summer Research Mentoring Program.....	114
<i>Yuna Dai and Monique Woodard</i>	
Epistemic Network Analysis to study Transformative Learning while teaching Robotics in elementary STEM Education	118
<i>Beatriz Alejandra Galarza Tohen, Ana Paula Giacomassi Luciano, Arquimedes Luciano and Ruth Akumbu</i>	

Keynotes

Flowcharts all the way down 123

David Williamson Shaffer

The Submarine, the Witch, and the Bridge 124

Eric Hamilton

Cartographies of Becoming: Toward a Rhizomatic and Justice-
Oriented Quantitative Ethnography in the Age of Algorithmic
Sovereignty (The algorithm mirage)..... 125

Erik Huesca Morales

Students' voices on smartphones and artificial intelligence in the infrastructure for learning and social interactions in Finnish lower secondary school

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Abstract. This dissertation investigates students' perceptions of the use of smartphones and artificial intelligence (AI) for learning and social interaction in lower secondary school. The regulations related to smartphones have been featured a lot in societal discussion during recent years, and the role of AI increases in peoples' lives continuously. Yet, there is not much research on students' voices regarding the topic. This study builds on data from written assignments (N=55) and focus groups interviews (N=35) with lower secondary school students in Southern Finland. The study employs a mixed methods approach, and the data is analyzed using qualitative content analysis and Epistemic Network Analysis (ENA). Preliminary results show that students place a lot of value on smartphones as a social connector as well as a means for studying while also recognizing the hindrances they place for peer relationships and focus. Students' ways and attitudes toward utilizing AI tools for studying vary greatly between students, consisting of refusers, users, and abusers.

Keywords: Smartphones, lower secondary education, peer relationships, artificial intelligence

1 Goals of the research

This study investigates Finnish lower secondary school students' perceptions regarding the role of smartphones and AI in school, addressing the following questions:

1. What are lower secondary school students' perceptions of smartphones as learning tools in school?
2. How do lower secondary school students perceive the role of smartphones in social interaction during their school day?
3. What are lower secondary school students' views on using AI tools in school?

2 Background

Smartphones have become integral to young people's lives, with 99% ownership among Finnish youth. While some youths use smartphones for studying, typical school usage focuses on entertainment and messaging [1,2]. There is limited research on Finnish youths' experiences of smartphone usage in schools, and this study also fills the research gap of investigating how students view the use of AI in schools. There is conflicting research on smartphones' impact on learning. Some studies suggest a detrimental effect on academic performance, others argue that heavy smartphone users tend to fare better academically [3]. Smartphone usage is closely tied to social relationships, serving as a means of staying connected and deepening friendships through social media. However, smartphone dependence can also lead to poorer peer relationships and social skills [3]. Understanding smartphone and AI use in schools helps inform policies on smartphone and AI regulation.

3 Methodology

The data consist of written open-ended questionnaires (N=55) and focus group interviews (N=35). The data collection took place in two lower secondary schools in southern Finland with participants aged 14 to 15 years old. The study employs a mixed methods approach; the data is analyzed using qualitative content analysis and the results are quantified and visualized using epistemic network analysis [4].

4 Preliminary and expected findings

Preliminary findings indicate that students place a lot of value on smartphones as a social connector as well as a means for studying. Students also recognize the smartphone as an occasional hindrance to studying and are aware of the issues it creates for peer relationships, such as reduced face-to-face interaction. Students' ways and attitudes of using AI tools for studying vary greatly between students, as some students refrain from using AI tools, some misuse it, and others benefit from using it. The findings indicate a need for shared practices and education on the use of AI tools in schools.

5 Expected contributions

The findings will provide insights for political decision-making and enhance understanding of how smartphones and AI should be utilized in digital education in schools. This research provides students with a voice regarding the role of smartphones and AI in schools, which is emphasized in Finnish curriculum and under-researched [1].

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Understanding Changes in Teacher Dispositions Towards Mathematics and Mathematics Teaching

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Abstract. This study investigates primary mathematics teachers' values, beliefs, and enjoyment of doing and teaching mathematics before and after they participate in four professional learning workshops. Using a quantitative ethnography methodology, an epistemic network analysis is applied to understand associated changes in the teachers' values, beliefs, and enjoyment following the professional learning period. Initial results and findings are presented for one teacher as an illustrative case.

Keywords: Teacher Dispositions, Professional Learning, Mathematics

1 Goals and Background of Research

Many primary school teachers in Australia do not enjoy mathematics, or mathematics teaching (Russo et al., 2021). This is likely to have negative consequences for students. Professional learning for primary school mathematics teachers commonly focuses on developing teachers' curriculum and pedagogical content knowledge (Beswick et al., 2016), but little attention is given to developing teachers' positive dispositions towards both the doing and teaching of mathematics (Lamb, 2010).

A professional learning intervention, MICubed (Mathematical Identity), was developed for this study. The aim was to develop teachers' mathematics and pedagogical knowledge and foster enjoyment, confidence and engagement with doing and teaching mathematics. During four one-hour workshops, teachers worked in groups to solve mathematical problems, and discussed their mathematical identities and beliefs, what they valued in mathematics classrooms, and how they foster positive mathematical interactions. The research focus was to investigate reported changes in teachers' values, beliefs, and enjoyment of doing and teaching mathematics following their participation.

2 Methodology

Qualitative and quantitative data collection and analysis were employed for this study using a Quantitative Ethnography (QE) approach (Shaffer, 2017). QE enables elements

of a learning culture (such as teaching), to be analysed through visual and statistical representations of both qualitative and quantitative data (Kaliisa et al., 2021). These elements are coded and identified within data sets and mapped using an Epistemic Network Analysis (ENA) to analyse the connections between elements within the data.

Data was collected via three different instruments. These were: (1) Teacher beliefs surveys (pre and post participation); (2) Mathematical identity graphs that investigated emotional dispositions towards mathematics across a lifetime, and (3) Individual pre and post participation interviews. Participants were drawn from two Australian primary schools and were selected to represent a range of different values, beliefs and enjoyment levels with the doing and teaching of mathematics following their initial beliefs survey.

3 Preliminary Findings and Expected Contributions

Preliminary analysis suggests that the MICubed professional learning has contributed to building teacher confidence and enjoyment of doing mathematics and teaching mathematics. Evidence for this includes an exploratory ENA using data collected from one participant, and early data coding and thematic analysis of other participants' data sets.

This research can contribute to the emerging literature associated with using ENA to describe mathematics learning cultures in primary schools. The identification, understanding and description of the emotional dispositions of teachers is an inherently qualitative process, commonly approached through interviews and observations. By employing ENA within a QE approach, statistical rigour is applied to the analysis of these qualitative data sets, and nuanced analyses can be made. Preliminary findings indicate that ENA has the potential to describe changes in teachers' beliefs and values towards, and enjoyment of doing mathematics and teaching mathematics.

Acknowledgments. I gratefully acknowledge the participating teachers, and the guidance of my PhD supervisors, Ann Gervasoni, Penelope Kalogeropoulos and James Russo.

Disclosure of Interests. The author is currently a PhD candidate at Monash University in Victoria, Australia. The author is also employed as a school principal in Victoria, Australia.

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Learning from the Uncertainty: Identity Development of International Students

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Abstract. This research will investigate how international students in the U.S. postsecondary institution navigate socio-cultural and political challenges, focusing on how shifting immigration policies influence their identity development. Using Ordered Network Analysis, the study will trace evolving students' narratives of identity development, negotiating belonging, and perception in response to shifting immigration policies across various academic year groups. Moving beyond traditional models and dominant assumptions, this research aims to offer a more context-sensitive framework and propose actionable strategies for institutions to better support their international student body under pressure.

Keywords: International Student Engagement, International Students Perspectives, Student Affairs, Identity Development, Educational Policy, Ordered Network Analysis

1 Goals of the Research

This study will investigate how international students at U.S. postsecondary institutions adapt to academic and socio-cultural challenges over time, with a particular focus on evolving immigration policies and administrative barriers post pandemic. Specifically, it will assess how these factors, such as visa restriction, working status uncertainty, and changing SEVP guidelines, shape their experiences and influence on their academic and professional trajectories. Building on E.Kim's International Student Identity (ISI) model [1], this research will extend the model by incorporating the impact of administrative constraints into students' adaptation processes beside linguistics, cultural, and social influences on identity construction [2, 3].

2 Background of the Project

In recent years, the growing presence of international students on U.S. college campuses has led to increasing scholarly attention on their campus involvement and identity development. E. Kim's ISI model challenges the application of traditional psychological identity theories and proposes a new perspective in understanding international student identity development [1]. Yet, the existing literature frames student's experience into broad structural and socio-cultural challenges while failing to identify the impact of shifting policy landscape and administrative uncertainties [3,4]. To fill the gap, this study proposes a more context-sensitive parameter to understanding international students identity development.

3 Methodology

The study will use a longitudinal design involving international students across various year groups at the same institution. Over the course of one academic year, participants will complete surveys, write self-reflective journals, and participate in semi-structured interviews. The combined data will be segmented based on six identity development stages outlined in the ISI framework [1], while the constructs/codes will be inductively developed based on the emerging topics within the discourse. Using ONA, the study will trace how these constructs evolve across student narratives. Secondary data sources will be also incorporated to close the interpretive loops to better support the findings.

4 Expected Findings

Quantified by the ONA model, the analysis is expected to trace and examine how key constructs co-occur across students' narrative over a whole school year, revealing the chronological sequence of influencing factors. More importantly, by conducting more nuanced comparisons across different year groups, the research will identify academic and socio-cultural needs that students respond to in various situations. These findings seek to inform institutional strategies for supporting international students in a more targeted and proactive way beyond sole reliance on federal guidelines.

5 Expected Contributions

This research aims to uncover the complexity of international student identity development, that it should not be under-theorized to generalized assumptions about students' linguistic, cultural, academic, social, or ethnicity unfamiliarity, nor solely rely on the models built for domestic student experience [2][4]. By contextualizing students'

adaptation within the post-pandemic political changing uncertainty, the study also aims to contribute for a timely and critical perspective, diversifying the predominant assumption in literature[2, 3, & 4]. Finally, the research seeks to propose actionable strategies that foster inclusive campus environments and contribute to advancing the agenda of intercultural competence education.

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Brain Activity and User Experience Observation in Educational Game Through Epistemic and Ordered Network Analysis

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Abstract. In my dissertation, I am investigating the application of Epistemic Network Analysis (ENA) and Ordered Network Analysis (ONA) to observe and visualize brain activity and user experience during educational gameplay. My research focuses on three core areas: (1) evaluating cognitive load and cognitive effort in educational quiz games, (2) combining brain activity, performance score, and user experience, and (3) using Quantitative Ethnography (QE) to model the complex interplay between neural activity and subjective experience. While most existing work in educational technology evaluates performance metrics or self-reports in isolation, my research introduces cognitive effort measurement considering both cognitive load and performance. To my knowledge, no prior studies have applied ENA or ONA to model the integration of brain signals and user experience in an educational quiz game. By addressing this gap, I aim to extend QE methodologies to a new domain of multimodal neuro-behavioral analysis. Through a multimodal approach, I combine functional near-infrared spectroscopy, interaction logs from educational quiz games, open-ended interviews, and self-reported user experience. Preliminary results from a stylus versus hand input study reveal modality-specific neural and experiential responses, offering a foundational step toward understanding cognitive dynamics in educational games. The findings of this thesis are expected to make a significant contribution to the fields of developing digital learning materials, quantitative ethnography, and human-computer interaction.

Keywords: Quantitative Ethnography · Epistemic Network Analysis (ENA) · Ordered Network Analysis (ONA) · fNIRS · Brain Activity · User Experience · Educational Game · LLM

Independent variables: I have the following factors: response strategy (scripted and baseline); response tone (empathetic and non-empathetic) ([Table 1](#)).

1 Background and Goals of the Research

Recent advances in digital learning tools, such as educational games, have made it easier to deliver adaptive content. These tools can be improved using Large

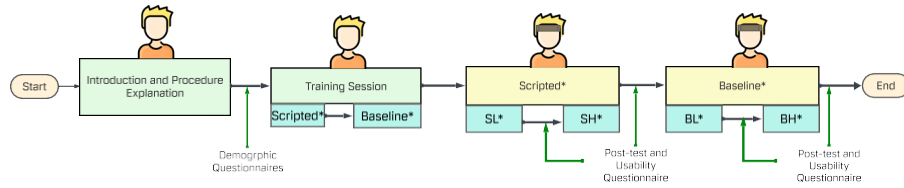


Fig. 1. Overview of the study procedure. The order of the conditions (marked with *) was counterbalanced.

Response Strategy	Low Empathy (L)	High Empathy (H)
Scripted (S)	Condition 1 (SL) Analogy instructions Neutral tone	Condition 2 (SH) Analogy instructions Empathetic tone
	Condition 3 (BL) No analogy instructions Neutral tone	Condition 4 (BH) No analogy instructions Empathetic tone

Table 1. 2 × 2 Experimental Conditions

Language Models (LLMs), but their impact on the brain during learning is still unknown. Most studies focus only on test scores or user feedback, missing what happens inside the brain during learning. At the same time, functional near-infrared spectroscopy (fNIRS) provides a way to measure brain activity in real time, especially in the prefrontal cortex (PFC), which is linked to attention, memory, and problem-solving [1].

In my research, I explore how educational tools like quiz games affect both brain signals and user experience. While human-computer interaction research often uses usability and performance data, these alone do not explain how learners think or feel. I apply Quantitative Ethnography (QE) to uncover deeper patterns in brain activity and user experience. In particular, I use Epistemic Network Analysis (ENA) to explore how brain activity and self-reported experience (e.g., frustration, usability) connect during the task [2]. As a starting point, I studied how input methods—hand versus stylus—affect brain activity and user experience in a quiz game. My future work will extend this to integrating LLM-based learning tools in educational quiz game to see how AI-generated help changes brain-behavior patterns and user experience. The goal is to use ENA to uncover how learning interfaces shape cognitive effort and design better digital tools that support deeper thinking without increasing mental load.

2 Methodology

My proposed work is within the subject 2×2 design. All participants will complete all my conditions (see Figure 1.)

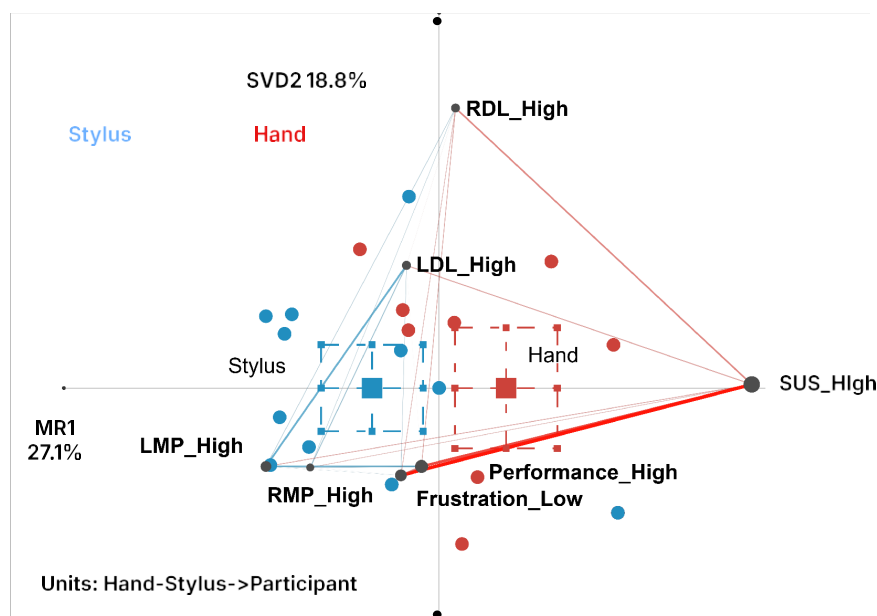


Fig. 2. Epistemic Network Analysis (ENA) plots comparing hand and stylus input conditions. An overlaid ENA space shows participant-level centroids and distribution across the two modalities. (The node positions reflect the ENA-projected space dimensions, which were derived from singular value decomposition (SVD) and achieved a high model fit (Pearson $r = 0.98$).

Dependent Variables: hemodynamic response, knowledge gain, self-reported measures to capture task load (NASA-TLX), system usability (SUS), and Interview. I will use ENA to visualize co-occurrence patterns between neural regions and user feedback per condition. ENA will be applied to examine sequence-level transitions in cognitive states and experience codes over time.

3 Preliminary Findings

As a preliminary step, I conducted a stylus vs. hand input study ($N=16$) using a similar quiz game. ENA revealed distinct brain-behavior networks between the two

modalities. ENA from the input modality study indicated a denser behavioral network for hand input, while stylus input engaged more distributed neural-frustration co-occurrences. Our model showed a clear separation between two input modalities (Figure 2). and to statistically validate this separation, we conducted a two-sample t-test on the X-axis means. The test showed a significant difference between Hand ($M = 0.21$, $SD = 0.31$) and Stylus ($M = -0.21$, $SD = 0.30$), $t(30) = 3.96$, $p < .001$, with a large effect size (Cohen's $d = 1.40$). This suggests distinct co-activation patterns of brain regions and behavioral outcomes across modalities.

4 Expected Contributions

I expect similar patterns in the LLM condition, where enhanced neural activation may not linearly correlate with perceived learning gains. ONA is expected to identify temporal shifts in cognitive effort during LLM feedback moments, especially in low-performing or high-frustration learners.

A validated, multimodal analysis pipeline integrating fNIRS, behavioral data, and QE. Novel insights into the dissociation between neural activity and subjective experience in AI-supported learning.

Recommendations for designing cognitively aware LLM-based educational tools.

Advancement of QE methodology by applying ENA and ONA to continuous brain-behavior signals.

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Aspirational Constructs in *The Federalist*: Cracking the Founders' Code to Enhance Civil Discourse

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Abstract. My dissertation deploys quantitative ethnography (QE) to find aspirational constructs in *The Federalist* that configure, decipher and fortify democratic discourse. Between 1774 and 1787, the Founders instrumentalized their sequential participation in Philadelphia Congresses to codify a transformative form of representative democracy. The Constitution consolidated the Founders' amalgamated vision into a governing protocol crafted to safeguard citizens from governmental tyranny. Three Founders, Madison, Hamilton, and Jay anonymously authored *The Federalist*, a series of eighty-five essays published between 1787 and 1788. These essays discerningly decoded the multi-layered rationale underpinning the Constitution's fundamental precepts. The Founders' communication practices pursued electoral consensus by going directly to the public with their political logic. This approach successfully shifted American polity from precarious dissension to an equilibrium bolstered by shared democratic identity. Political divisiveness in 2025 mirrors the discord threatening the Founders in 1787.

But today's political discourse unfolds predominantly online, where algorithms prioritize partisan contentiousness over public problem-solving. Digitally augmented connectivity has normalized a recursive loop of derisive rhetoric that factionalizes American citizens. This modern sociopolitical phenomenon contradicts the Madisonian axiom that broader civic engagement leads to greater pluralism and tolerance. Our 21st-century proclivity for digital platforms offering abbreviated formats for public discourse persists despite growing evidence that individuals prefer more personalized modalities for substantive social discussions. To inform future depolarizing interventions, my research examines artifacts from the formative social context that launched American identity. Salient ethnographic insights derived from ENA and ONA modeling of these artifactual data from *The Federalist* might enhance the developing interdisciplinary science of civil discourse.

Keywords: Civil discourse science, *The Federalist*, Political polarization, The Constitution, Civic engagement, Aspirational democratic discourse, Derisive digital rhetoric, Individual freedoms, Constitutional safeguards, The public good.

1 Goals of my research

- Understanding the drivers of polarization in different discourse contexts.
- Understanding the markers of functional discourse versus those of dysfunctional discourse.
- Understanding the role that digitization plays in uncivil discourse and partisan polarization.
- Understanding the role that personal agency plays in both mitigating and stoking polarizing discourse.

1.1 Background of my research

Today, most communication in the 21st century occurs via remote, digital-media-based exchanges of textual data [1,2]. The sociocultural shift to digital communication persists, despite increasing evidence that most individuals prefer more personalized communication modalities for discussions of more weighty social concerns [3,4]. The increasingly prevalent phenomenon of more distanced human interactions constitutes a paradox wherein overall digital engagement increases while political tolerance of differing viewpoints declines [5]. Despite current augmented access to connection with others, widening cultural divides have led to normalization of daily rancorous conflict on our internet devices [6,7].

My research studies historical texts written by the American Founders to elucidate the discourse principles that allowed them to successfully debate their myriad political differences. In 1787, the Founders faced an urgent, existential challenge to devise a unifying governmental system. This system had to coalesce thirteen distinctly opinionated states into a workable governing amalgam of heterogeneous political positions. The Founders' genius lay in their ability to distill a cacophony of divergent positions into a shortlist of core ideals that encapsulated the new nation's aspirations. A paramount mantra emerged to reiteratively pursue a collective path toward "a more perfect union". To that end, they codified the Constitution to protect individual dignity and liberty.

Disagreement was rampant in both Continental and Constitutional Congresses held in Philadelphia between 1774 and 1787. Members of these congresses found themselves embroiled in heated political deadlock like that found in our 21st-century American politics [8]. Today's digitized discourse still mirrors the messy lack of agreement endemic to their aspiring democracy. The migration of political discussion onto digital platforms, however, seems to increasingly detach citizens from a process of civic engagement that remains receptive to dissenting opinions.

2 Methodology

I will conduct both ENA and ONA modeling of textual data from three essays from *The Federalist*. I will create a codebook based upon a priori codes derived from scholarly literature. I will then work with a minimum of two fellow graduate students (who agree to volunteer their time to assist me in coding) to collectively finetune the codebook, as

needed. We three will then independently code the textual data from the essays using the finalized codebook. Any discrepancies in coding will be addressed by achieving consensus through social moderation between the coders. Inter-rater reliability will be measured by Cohen's kappa.

I will also obtain a second set of coded textual data produced from the assessment transcripts recorded from my interviews with three mental health experts (MHEs). My group of three students will again independently code all utterances from the three MHE transcripts using the finalized codebook referenced above. This will generate a separate set of coded data for all three MHEs' transcripts, which will also be modeled using ENA and ONA. This second coding of MHE transcripts was inspired by a recent group study I co-authored looking at drivers of polarized discourse [9].

As in our recent group study in 2025, my dissertation will explore the potential amplification of ENA and ONA by triangulating each of these modeling tools, respectively, with traditional QE coding and expert psychological insights. Comparisons of the visualizations produced by each of the three modeling approaches for the two datasets will provide insights regarding how uniformly or disparately the constructs are identified across the triangulation of three different methods for modeling the same set of constructs.

RQ 1: Is robust civic engagement essential for democracy to function?

RQ 2: How do personal agency tradeoffs in digital communications factor into a user's evaluation of whether to use a given digital communication modality?

RQ 3: How can civil society instrumentalize lessons gleaned from discourse patterns in *The Federalist*?

3 Expected Findings

Empirical evidence of motivational constructs that persuade communicants to engage in self-reflection, self-regulation, and reasoned problem-solving.

Empirical evidence of the Founders' strategic use of discursive structures and motivational constructs that compel citizens to proactively develop a sense of individual agency.

4 Expected contributions

Increased understanding of polarization's causes can aid policymakers and individual citizens in addressing the behavioral patterns that lead to uncivil discourse. Many individuals, organizations, and governments currently feel at a loss to respond to anti-social behaviors that appear ubiquitous and entrenched, particularly in digital contexts.

By mapping and comparing the discourse dynamics inherent to digital media exchanges with those seen in *The Federalist*, my research hopes to help individuals better navigate their own behavior in the interest of creating a more hospitable setting for the civil dialogue essential for a viable democracy.

ENA and ONA visualizations of constructs emerging from discourse configurations catalyze visual evidence for broader society to observe the deleterious effects for participants who silo themselves in anti-social discourse patterns. Participants opting into democratic discourse can become more sophisticated and discerning citizens.

Careful study of American historical artifacts, like essays from *The Federalist*, reminds citizens that early Americans faced similarly divisive, sociopolitical challenges to those experienced today. The accumulated experience of democracy's for-bearers, including both mistakes and triumphs, can be humanizing and regenerative [Casarejos].

Increased awareness regarding historical patterns of conflict mitigation and escalation can prime citizens to be attentive to unnecessary hostility around them and to seek out more civility in their engagement with others. This awareness can also lead to an increased sense of personal agency that avoids or rehabilitates degenerative discourse in communities [10].

Civil discourse research provides for reflective grounding in a frenetic, 21st-century environment that changes constantly due to exponential technological growth and explosive data proliferation [11]. It seeks common ground in situations where meaningful collaboration might appear impossible.

Empirical observation of *The Federalist* reminds citizens of the Founders' important intergenerational legacy of responsibility to uphold civility and reasoned argumentation [12]. Historical research's affirmation of social cohesion's role in sustaining democratic civilization can help individuals stuck in habitual, online conflict to find a more advantageous form of discourse that passes a hopeful cultural ethos to subsequent generations [13].

The depth of analysis embedded in *The Federalist*'s expository communication reinforces that oversimplification of complex issues to reductive blaming undermines the sociopolitical intelligence of political discourse by dehumanizing those who disagree with a given ingroup's positioning [14].

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Epistemic Trajectory Modeling: A Method for Modeling, Visualizing, and Comparing Learning Processes

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Abstract. This dissertation develops Epistemic Trajectory Modeling (ETM), a method for modeling, visualizing, and comparing the temporal evolution of learners’ understanding. Building on Quantitative Ethnography (QE) methods such as Epistemic Network Analysis (ENA) and Ordered Network Analysis (ONA), ETM addresses the limitations of aggregate models by explicitly modeling trajectories as movement through conceptual space. ETM integrates smoothing, dimensionality reduction, curve fitting, and trajectory-comparison metrics to generate interpretable representations of learning.

1 Goals of the Researcher

The goal of this dissertation is to develop Epistemic Trajectory Modeling (ETM), a methodology for addressing a fundamental question in the analysis of learning process data: What underlying structures of understanding drive learners’ actions, and how do these structures evolve over time? Current approaches to learning trajectories often divide the process into discrete phases, assuming clear boundaries between them or requiring researchers to predefine critical time points for aggregation. While useful for some purposes, these methods risk obscuring the continuous and interdependent nature of learning. ETM instead treats learning as an ongoing process, allowing the data itself to reveal turning points and changes. It aims to derive and represent these evolving processes in ways that are mathematically rigorous, theoretically grounded, and visually interpretable, offering a new perspective on how learning unfolds over time.

2 Background of the Project

Within Quantitative Ethnography (QE), methods such as Epistemic Network Analysis (ENA; Shaffer et al., 2016) and Ordered Network Analysis (ONA; Tan et al., 2022) have modeled learning as evolving networks across time. However, these techniques produce cumulative models that might obscure temporal nuance. For example, Kang et

al. (2023) examined joint attention dynamics in an immersive astronomy simulation by dividing multimodal engagement into predefined phases. While useful, such stage-based approaches are limited in capturing continuous change. Beyond QE, techniques such as hidden Markov models have also been used to model temporal learning data, but they require strong assumptions about states or transitions that limit interpretability. Brohinsky and colleagues (2021) advanced this line of work by visualizing trajectories in ENA, but noted challenges in scaling to more than two trajectories and in supporting interpretation. ETM aims to address these limitations by deriving mathematical representations of understanding directly from process data, visualizing how these representations change over time, and providing statistical tools for comparing trajectories across individuals and groups.

3 Methodology

The ETM pipeline currently consists of seven stages. The first five are relatively complete, each with a default approach but open to alternatives; the last two remain under development. (1) Accumulation: encode data as time-stamped adjacency vectors. (2) Smoothing: stabilize noisy signals while preserving temporal order. (3) Dimensionality Reduction: use Singular Value Decomposition or related methods to project high-dimensional vectors into low-dimensional spaces. (4) Trajectory Fitting: treat x–y coordinates as functions of time and fit polynomial regressions to generate continuous paths.

(5) Trajectory Comparison: compute integral distances over shared time intervals. (6) Trajectory Movie: create dynamic visualizations of trajectories over time. (7) Closing the Interpretive Loop: link trajectories back to qualitative examples in the original data.

A Star Wars dataset has been used for prototyping and illustration; validation will draw on collaborative discourse and surgical teamwork datasets.

4 Preliminary or Expected Findings

Pilot studies with the Star Wars dataset show that ETM produces interpretable trajectories aligned with narrative arcs. For example, Luke Skywalker’s trajectory reflects a gradual transformation from curiosity to ambition, while Darth Vader’s reveals a more constrained path focused on war strategy and violence. These results demonstrate the feasibility of the pipeline, stability of smoothing methods, and interpretability of comparison metrics. Expanded findings will be presented during the consortium.

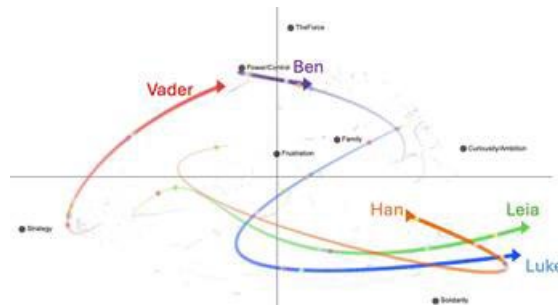


Fig. 3. Illustrative example of ETM trajectories using data from the Star Wars toy dataset.

5 Expected Contributions

This project contributes at three levels. Theoretical: it reconceptualizes learning as evolving structures of understanding rather than discrete phases. Methodological: it introduces ETM as a framework for modeling, visualizing, and comparing high-dimensional, time-ordered data. Practical: it provides visualizations and metrics that help researchers and practitioners interpret learning processes.

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Languaging and Translanguaging in Multilingual Learners' Education

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Abstract. In today's increasingly multilingual classrooms, students draw on complex and dynamic linguistic resources to learn, communicate, and construct meaning. Traditional teaching approaches in the US often emphasize rigid language boundaries because of historical monolingual ideologies that permeate our school system, overlooking the rich linguistic practices of multilingual learners (MLs). This proposal presents a line of research that investigates *languaging* and *translanguaging*—two interrelated concepts that capture how MLs actively use language to make sense of content, express identity, and engage with others—through the methodological framework of Quantitative Ethnography (QE).

1 Background and Theoretical Framing

Languaging, the process of shaping and reshaping ideas through language (Swain, 2006), emphasizes the role of language in cognition and learning. For MLs, who come to school with rich linguistic repertoires that include two or more languages, translanguaging—the deployment of a learner's entire linguistic repertoire without strict separation between named languages (García & Wei, 2014), can be a critical tool for learning, identity development and social interaction. Languaging and translanguaging challenge monolingual ideologies and value MLs' language practices as resources, rather than as obstacles, in learning. While these language practices are common among MLs, many teachers are still trying to figure out their role in the pedagogical practice, where external pressures to meet English language proficiency standards can lead to hesitancy to promote the use of multiple languages in an academic context.

Existing research on translanguaging as a pedagogical practice is rich in qualitative insights but is limited in systematic approaches to examine translanguaging across contexts. Conversely, quantitative studies frequently fail to capture the situated, meaning-rich nature of multilingual practices. This agenda aims to bridge that gap by employing QE (Shaffer, 2017)—a method that integrates qualitative richness with quantitative rigor to make valid statistical claims about complex, contextualized data.

The researchers who designed this agenda lead a research center focused on issues related to the education of MLs spanning policy, teaching and learning, and identity. As a collective, they have explored these issues using qualitative and quantitative

methodologies. Adopting a QE lens has the potential to expand the methodological scope of the center and deepen our inquiry related to ML education.

1.1 Research Questions

The line of inquiry proposed addresses research questions such as the following:

1. What impact, if any, do translanguaging pedagogies have on MLs' participation and learning?
2. How do teachers enact translanguaging pedagogies when teaching MLs?
 - Are there particular learning trajectories that pre-service and novice teachers follow in their uptake of translanguaging pedagogies?
 - How, if at all, do teachers incorporate translanguaging pedagogies with other teaching practices? What opportunities, if any, do teachers miss for incorporating translanguaging? What impact is there when translanguaging opportunities are harnessed or missed?
 - Is there a relationship between teachers' enactment of translanguaging pedagogies and teachers' specific experiences or backgrounds?
 - How do policies around multilingualism, language use, and translanguaging impact teachers' use of translanguaging pedagogies?
3. Do teachers in international contexts employ translanguaging pedagogies differently than in the US?
 - How does the linguistic diversity of the community impact, if at all, the use of translanguaging pedagogies in international schools?
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 - How do school demographics impact, if at all, the use of translanguaging pedagogies in international schools?
4. How can QE be used to model and visualize language and teaching practices in ways that inform educational research and pedagogy?
 - What relation, if any, does QE highlight between contextual factors and teachers' use of translanguaging pedagogies?
 - What relation, if any, does QE highlight between teachers' experiences and backgrounds and their use of translanguaging pedagogies?
 - What relation, if any, does QE highlight between teachers' use of translanguaging pedagogies and the ways in (and purposes for) which MLs participate during teaching and learning?

2 Methodology

The first study in this research line draws on data collected via mixed-reality simulations (MRS) of pre-service teachers learning to incorporate language and core teaching practices. MRS are online environments where participants safely rehearse new skills with student avatars controlled by trained actors. The simulations were recorded and transcribed for a previous National Science Foundation project. Additional data could be collected from bilingual and multilingual K–12 classrooms, including video-recorded lessons, student work, and interviews. In this line of research, QE could support: Qualitative coding to capture meaning-rich units of language, including instances of code-switching, metalinguistic reflection, translanguaging, and cognitive engagement through discourse; Epistemic Network Analysis (ENA) to identify and visualize co-occurrence patterns among codes across different policy and instructional practices in the education of MLs; and Quantitative comparisons to assess how discourse practices vary by language background, instructional context, or subject area. By applying ENA, future research could map how students coordinate cognitive and linguistic resources across languages during meaning-making processes, revealing discourse networks that reflect underlying learning dynamics.

3 Significance and Contributions

This research makes several important contributions:

- **Methodological innovation:** It demonstrates the potential of QE to analyze connections between various aspects of ML education—at policy and instructional levels.
- **Theoretical advancement:** It extends understanding of languaging and translanguaging by identifying their role in learning processes through empirical discourse patterns.
- **Practical implications:** The findings support asset-based instructional practices that affirm students' linguistic resources and advocate for translanguaging-friendly pedagogy and policy.

By focusing on how teachers support languaging and translanguaging in simulated and real educational settings—and how those practices can be rigorously studied—this work contributes to equitable and inclusive education research. It invites educators and scholars to reimagine multilingualism not as a challenge to be managed but as a vital resource to be understood, supported, and celebrated.

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Examining Latinx Students' Trajectories in STEM: Critical Elementary Classroom for Higher Education Success

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Abstract. This RAD proposal presents a study that examines how early exposure to critical pedagogy shapes Latinx students' long-term STEM educational trajectories. Drawing from in-depth retrospective interviews with three former students, now college students majoring in STEM fields, the study employs thematic analysis and Epistemic Network Analysis (ENA).

Keywords: Latinx students, STEM, Quantitative Ethnography.

1 Area and Domain of Research

The research area for this proposed RAD is Social and Behavioral Sciences and Education.

2 Background

The education system often mirrors and sustains social hierarchies, serving as a tool for institutionalizing inequality and preserving marginalization and exclusion [1]. These inequities are evident in the overlap between poverty and educational disparities. Mexican American students have historically faced systemic exclusion, including school segregation, limited resources, and discriminatory tracking [2]. Moreover, studies have shown that high-achieving students from racially minoritized backgrounds often face unwelcoming environments in STEM, which can contribute to their departure from these disciplines [3]. However, previous research has also shown that a critical pedagogy from an early age can prepare students to feel empowered to dismantle systemic barriers [4].

3 Research Objectives

This research study aims to address the following research questions: (1) What types of learning activities and interactions shape Latinx students' STEM identity development? (2) What patterns of discourse, collaboration, and problem-solving can be identified as critical leverage points for supporting Latinx persistence in STEM pathways?

Drawing on in-depth interviews, this research examines how exposure to critical pedagogy in elementary classrooms fostered critical consciousness. This study is grounded in Paulo Freire's theory of critical pedagogy [6], which is rooted in the belief that education should be a transformative process that empowers individuals to critically engage with their reality. Critical pedagogy aligns with an ENA [7] approach, which enables the visualization and measurement of connections among key concepts, practices, and discourses that emerge over time. This approach is valuable for understanding Latinx students' educational experiences, as it captures student discourse, praxis, and *how* they build meaning through linked ideas and interactions. By mapping patterns of discourse and practice, ENA can reveal the epistemic frames — the ways of thinking, knowing, and participating — that support or hinder students' development of STEM identities.

4 Prior Experience and Expectations

This research team consists of four Latina scholars who are interested in incorporating QE into our broader research agendas and are centering this data examining the trajectories of STEM Latinx scholars to gain confidence in utilizing, and eventually teaching, the ENA software to create windows and networks to find connections among qualitative codes.

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Combining Social and Epistemic Network Analysis to study teachers' relational agency

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Abstract. Education is fundamentally relational. The norms and interactions that shape relationships in schools are consequential for teachers' and pupils' sense of belonging in schools, as well as learning. Recent health crises and migration flows have highlighted teachers' critical role in creating inclusive relational environments in the contexts of uncertainty and increasing diversity of school populations. However, relational indicators are conspicuously absent in the evaluation systems and policy interventions, which usually focus on narrow indicators of performance, while teachers' vital relational knowledge remains *tacit*. RelatED aims to uncover teachers' relational knowledge base by examining a promising but under-researched concept of *relational agency* (RA) – a capacity to respond critically to problematic situations through mutual support and knowledge exchange. RelatED proposes new conceptual and methodological approaches to operationalise the 'black box' of RA to uncover the patterns of interactions and norms that shape relationships in schools. It will conduct 4 mixed-method studies in 8 schools in Scotland, Sweden, Belgium and Serbia to understand how teachers develop RA in different institutional contexts.

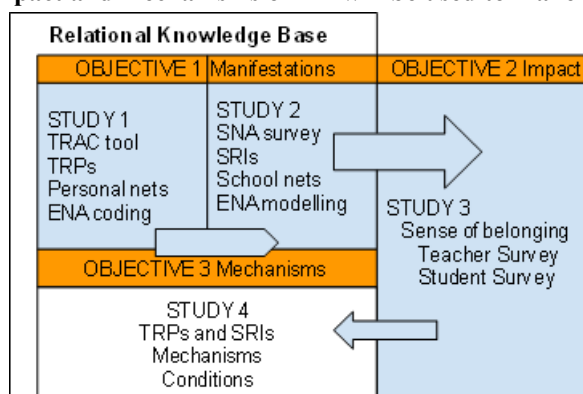
1 Introduction, Aims and objectives

RelatED proposes a combined SNA and ENA approach to make explicit how norms and interactions that underly teachers' relationships with pupils, colleagues and other actors create and sustain relational climates that facilitate their own and, indirectly, their pupils' sense of belonging in schools. It departs from the established notion of teaching as a matter of applying individual competence to operationalise a promising, but under-researched concept of relational agency (RA) as a mechanism for inclusive community-building. The project aims to make explicit teachers' relational knowledge base by understanding how they create and sustain collaborative, transformative relationships. It has three Objectives:

1. Understanding the manifestations of Relational Agency (RA) at teacher and school levels;
2. Examining the impact of RA on teachers' and – indirectly – pupils' sense of belonging in schools;
3. Understanding the mechanism for developing impactful RA across different institutional contexts.

Understanding manifestations of RA at teacher and school levels (Obj. 1), will involve comparative case studies conducted in eight school sites in four different educational systems that present different institutional conditions for individual and collective RA. Studies 1 and 2 focus on manifestations of RA at teacher (Study 1) and school (Study 2) levels to develop Teachers' Relational Profiles (TRP) and School Relational Index (SRI) respectively. These studies are designed to identify the core elements of RA that inform its operationalisation in ways that can be used to examine **the impact of RA on both teachers' and – indirectly – pupils' sense of belonging (Obj. 2)** in Study 3, and **the mechanisms for developing such impactful RA (Obj. 3)** in Study 4. Study 3 examines the conditions and impact of RA such as policy and organisational factors that facilitate belonging in schools measured with the established scales such as Goodenow's (1993), including items like "I can really be myself at my school". Study 4 focuses on understanding the mechanisms of RA by analysing changes in teachers' networks and sense of belonging over time and across sites to identify key elements of RA conducive to transformative change in schools, in varying conditions that involve implementing and challenging norms – a new, community-driven approach to teaching. Together these studies identify practices that facilitate RA for holistically

addressing pupils' needs and inform the relational knowledge base underlying RA with transformative potential, and its implications for teachers' transformative learning. **In-sights on the manifestations, impact and mechanisms of RA will be used to make explicit teachers' tacit relational knowledge** that facilitates belonging under various conditions. The premise of collective mobilisation of support and knowledge in schools will enable theorising how collaborative, inclusive relationships develop from interactions. The paper will discuss how SNA and ENA can be combined to examine changes in teachers' epistemic frames within the composition of the whole-school networks.



2 Operationalisation and data collection

Mixed-method data on 1) the manifestations of RA at the teacher and school levels (networks and coded contents of interactions) will be used in the subsequent studies to address the questions about its impact, conditions and change mechanisms. We expect the RA to manifest in teachers' interactions with pupils and their families, colleagues and other professionals or community members,

evidenced by Teachers' Reflection on Agency for Change (TRAC) log which I developed and tested for collection of data on the norms and interactions that underlie RA and coding schemes for assessing their alignment with inclusive pedagogy (Pantić, 2021; Pantić et al., 2022). The log includes three sections as follows: the WHAT section asks teachers to report on the purposes of interactions (e.g. describe a situation in which they reached out to other actors for supporting a pupil); in the WHO section teachers report whom they reached out to and how they supported them (e.g. advice seeking, information exchange, or collaboration); and the WHY section invites teachers to reflect on the outcome of interaction – how it benefited them and/or the pupil, and how they perceive the contexts that enabled and/or created barriers. All teachers in each site will be invited to fill out the log at the same times as the social network survey, including sense of belonging scales for teachers (Bjorklund et al., 2020) in year 1, followed by interviews and observations, and the second and third round of log and survey data in years 2 and 3. Together with pupils' sense of belonging scales (Goodenow, 1993) this data will be used to examine 2) the impact of RA; and school and policy conditions that foster 3) the development of RA complemented by other interview data with relevant actors. A sub-sample of up to 10 teachers in each site will be identified for interviews to include relevant informants in the diverse key roles, as well as at least 10 pupils in each school, family members and other stakeholders such as local authorities (10- 15 interviews per site), focusing on the questions about belonging, agency, collaboration and change. **Data analysis** will be conducted in 4 studies as follows.

Study 1 starts with coding the textual log and interview data to generate **TRPs**. The interactions reported in TRAC log will be coded applying theoretically-based coding scheme that captures RA by distinguishing codes for acting as pro-active 'agent of change' focused on holistic pupil support, and those of 'role-implementation' focused on applying procedures. ENA will be used to construct teachers' *epistemic frames* to uncover the patterns in how particular purposes such as focus on learning or dealing with diversity relate to their interactions in social networks (collected in the WHO section of the log that generates teachers' social (ego-)network data – i.e. their personal networks of people with whom they discuss important matters. We will examine network properties such as network size, diversity of alter attributes, crossing the school boundaries).

Study 2 will compare teachers' epistemic frames across school sites to explore how different codes relate to each other and compare groups or individuals. To generate the **SRI** study 2 will use the whole school network properties generated by teacher survey (e.g. centrality, community detection) together with the qualitative data from schools (e.g. holistic focus on pupils' needs/or on academic performance; norms around recognition of diversity, etc). Operationalising RA through teachers' underlying purposes, social interactions and engagement with the institutional contexts will enable examining the

patterns of interdependence of social and epistemic networks to identify types of RA in different school and policy contexts in ways that enable statistical analysis of its **impact** on teachers' and, indirectly pupils' sense of belonging in Study 3 and development of RA in Study 4.

Study 3 will examine aspects of SRI associated with positive impact on belonging, i.e. impact of network properties and their underlying epistemic frames, e.g. holistic focus on learning and wellbeing can be expected to be positively associated with pupils' sense of belonging; and the conditions that enabled or hindered such impact, e.g. features of school cultures or policies that enabled collaboration.

Study 4 will examine the **mechanisms** of change in the interactions between teachers' and schools' social and epistemic network properties that facilitated development of impactful RA, e.g. through influence and selection processes, focusing on moment-to-moment interactions as mechanisms for building more stable relationships that shape relational environments over time.

Modeling Partnership Dynamics in Early Learning: Developing a Quantitative Ethnographic Approach for Program Evaluation and Scaling

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Abstract. Partnership-based models in early childhood education show promise for creating sustainable, scalable interventions, yet understanding which specific partnership attributes drive success remains challenging. This Research Agenda Development proposal outlines plans to apply Quantitative Ethnography and Epistemic Network Analysis as one component of a mixed-methods evaluation of the Good Hope Early Childhood Learning Center (Boise, Idaho), a comprehensive early learning initiative launched in 2020. Analysis of stakeholder interviews, participant surveys, and document analysis from this successful partnership between the GrowSmart Schools Children's Foundation and multiple community partners may provide insights for scaling. We seek community guidance on using ENA to systematically model stakeholder discourse about partnership attributes and success indicators, moving beyond descriptive accounts to identify essential collaborative elements for program replication. This represents a unique opportunity to apply QE methods in a non-university partnership context focused on actionable insights for non-profit organizations. We seek methodological guidance on coding development, network interpretation, mixed-methods integration, and translating ENA results into practical replication guidance for partnership-based educational initiatives.

Keywords: Partnership Evaluation, Stakeholder Discourse, Program Scaling, Early Childhood Education

1 Area and Domain of Research

The proposed research study is in the domain of Early Childhood Education, Healthcare-Education Integration, and Philanthropic/Foundation work.

2 Background: From Partnership Success to Systematic Understanding

The Good Hope Early Childhood Learning Center (Boise, Idaho) launched in 2020 through collaboration between the GrowSmart Schools Children's Foundation and multiple community partners, successfully providing no-cost, quality early education while graduating children kindergarten-ready. The Foundation now seeks to understand which specific partnership attributes drove this success to inform future replication efforts.

This presents the "evaluation-to-scaling challenge": moving beyond rich descriptive accounts to systematic identification of essential collaborative elements. Traditional approaches struggle; qualitative methods provide depth but limited systematic comparison, while quantitative approaches may miss nuanced partnership dynamics.

We propose incorporating Quantitative Ethnography (QE) and Epistemic Network Analysis (ENA) as one component of a broader mixed-methods evaluation approach. This represents a unique opportunity to apply QE methods in a non-university partnership context—while not a traditional research-practice partnership, our collaboration involves multiple non-profit partners generating actionable insights for program scaling. As researchers new to QE methodology, we seek community guidance on effective implementation within our broader methodological framework.

3 Research Objectives

3.1 Research Questions:

1. How can stakeholder discourse about partnerships be systematically modeled to identify essential collaborative attributes in early childhood education?
2. What QE approaches best analyze multi-stakeholder perspectives on complex community partnerships?
3. How can ENA results translate into actionable guidance for partnership-based program replication?

3.2 Conceptual Framework

We conceptualize partnerships as complex discourse communities (partnership discourse) where success emerges from specific interaction patterns. Our hypothesis: ENA can model these patterns by analyzing how stakeholders discuss partnership attributes relative to outcomes, revealing central collaborative elements.

3.3 Methodology and Areas for Guidance

Data: We have completed 11 stakeholder interviews, participant surveys, and comprehensive document analysis from the Good Hope initiative.

Analytical Approach: As part of mixed-methods evaluation design, we envision using ENA to model co-occurrence patterns between partnership codes and success indicators within stakeholder discourse, complementing traditional qualitative analysis and quantitative survey findings.

Seeking Community Guidance On:

1. **Coding Development:** Operationalizing partnership attributes as ENA codes; balancing etic/emic approaches for multi-stakeholder contexts
2. **Segmentation Strategy:** Preserving meaningful discourse units while enabling network analysis
3. **Network Interpretation:** Identifying "essential" versus peripheral partnership attributes; statistical approaches for partnership centrality claims
4. **Mixed-Methods Integration:** Effectively combining ENA with traditional qualitative analysis and survey data
5. **Non-University Context:** Adapting QE for non-academic partnerships focused on actionable non-profit insights
6. **Practice Translation:** Communicating network models to practitioners needing replication guidance

3.4 Discussion Areas and Collaboration

With data collection substantially complete, we seek concrete methodological discussions about analyzing collected transcripts, surveys, and documents. Key areas include:

- **Immediate Application:** Best approaches for initial coding and segmentation with our specific dataset
- **Validation:** Ensuring ENA models represent partnership dynamics rather than just discourse patterns
- **Temporal Dynamics:** Capturing partnership evolution rather than static relationships
- **Stakeholder Engagement:** Involving community partners in QE analysis for cultural responsiveness

4 Prior Experience and Expectations

This is my first QE study. I want to use QE as part of a mixed methods approach.

This agenda could advance QE methodology by demonstrating applications in real-world, non-university partnership evaluation where findings inform practical decisions.

The unique positioning outside traditional research-practice partnerships offers insights for direct non-profit application.

For early childhood education, this mixed-methods approach could provide systematic frameworks for understanding and scaling partnership-based interventions, with QE offering distinctive insights complementing traditional evaluation methods. Based on my limited knowledge of QE, I think it can be used for “partnership-discourse” to gain analytical insights into partnership dynamics for successful implementations.

Artisans online. Mapping organizational change through digital ethnography

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Abstract. In an era of rapid technological transformation, traditional artisan organizations in Mexico confront the challenge of integrating into digital ecosystems while preserving cultural traditions and community based organizational practices. This study offers a methodological investigation using digital ethnography, enhanced by qualitative content analysis and in-depth interviewing, to explore how artisan textile collectives across diverse Mexican regions navigate and appropriate digital tools for promotion, community cohesion and preserve cultural heritage. Principal key findings include patterns of digital appropriation: from WhatsApp communication to adaptive social media campaigns showcasing artisanal techniques; cultural heritage visibility strategies: crafting online narratives to communicate origin and meaning, reinforcing cultural identity and; collective digital coordination: new digitally mediated collective decision-making, logistics coordination, and knowledge exchange.

This digital ethnographic approach effectively captures the hybridization of physical and online organizational dynamics, a contribution to quantitative ethnography (QE), as it operationalizes real-world digital artifacts and practices like engagement metrics, as ethnographic data. The approach blends qualitative depth with quantitative structure, enabling to trace interaction networks, measure the reach of heritage narratives, and identify gaps in digital inclusion.

Implications are far-reaching for organizational studies and the digital transformation of economic decolonization. The research contributes to ongoing frameworks in QE by demonstrating how artisanal collectives emerge as culturally situated and digitally propelling organizations. Furthermore, it highlights digital inclusion's role in fostering community resilience, cultural preservation, and equitable market access. By merging digital ethnography with organizational analytics, this work provides insight into hybrid fieldwork, expanding the methodological horizons to understand complex data-rich human phenomena in digital contexts.

Keywords: Digital ethnography, quantitative ethnography, organizational studies, artisan sector, cultural heritage, digital inclusion.

1 Quantitative Ethnography in research

The digital revolution has created a vast space of interconnected information, communication, and interaction [1]. Quantitative Ethnography (QE) is an emerging methodological approach that integrates the interpretive depth of ethnography with the systematization of quantitative analysis. Introduced by David Williamson Shaffer (2017), QE emphasizes the use of digital trace data, such as online interactions, logs, or engagement metrics, as a form of ethnographic evidence. Rather than treating qualitative and quantitative paradigms as oppositional, QE seeks to unify them through modeling techniques that capture the meaning-making processes of human activity while also enabling scalable analysis.

At its core, QE builds on the premise that the increasing digitization of social life generates vast data sets that are rich in context but often underutilized in ethnographic research. By applying tools such as Epistemic Network Analysis (ENA), researchers can map patterns of discourse, collaboration, or decision-making, thus transforming digital artifacts into analyzable traces of culture [2, 3, 4]. This allows for the identification of relational structures that go beyond isolated narratives, bridging individual experiences with collective organizational practices. ENA is a method for identifying and quantifying connections among elements in coded data and representing them in dynamic network models. Such models illustrate the structure of connections and measure the strength of association among elements in a network, and they quantify changes in the composition and strength of connections over time [2].

2 Quantitative Ethnography for the study of Mexican textile artisan organizations

Ethnography is a way of looking at the world systematically. It uses data to explain how a culture functions [3]. The study of Mexican textile artisan organizations requires methodological approaches capable of capturing both the cultural depth of artisanal practices and the organizational transformations produced by digitalization. Digital ethnography provides an entry point by enabling researchers to immerse themselves in virtual environments where artisans communicate, coordinate, and showcase their work. Through participant observation, interviews, and qualitative content analysis, this first step allows the generation of analytical categories such as “digital coordination,” “cultural heritage visibility,” and “community resilience.” These categories emerge inductively from the field, grounded in the lived experiences and symbolic practices of artisan collectives.

Building on this qualitative foundation, Quantitative Ethnography (QE) offers tools to systematically analyze and model the relationships among these categories. Using Epistemic Network Analysis (ENA), the co-occurrence of codes across digital interactions (for example WhatsApp group messages, Facebook posts, Instagram narratives) can be mapped to reveal underlying structures of meaning-making. For example, ENA could demonstrate how discussions of cultural heritage are frequently linked to

collective decision-making processes, or how narratives of tradition intersect with strategies of digital marketing.

The proposed framework integrates Digital Ethnography and Quantitative Ethnography (QE) as complementary methodological approaches to capture the complexity of Mexican textile artisan organizations in their transition to digital ecosystems. This hybrid framework, combining Digital Ethnography with Quantitative Ethnography, enables us to move beyond thick description toward the operationalization of cultural constructs in measurable terms. While digital ethnography ensures the interpretive richness necessary to understand artisan worldviews and symbolic practices, QE provides scalability and structural rigor, making visible the relational patterns that underpin organizational adaptation in digital contexts.

Applied to Mexican textile artisans, such a hybrid framework highlights how traditional community-based logics coexist and hybridize with digitally mediated forms of organization. It also demonstrates how artisanal collectives are not only cultural actors but also digitally embedded organizations capable of negotiating visibility, identity, and market access in a globalized economy.

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Workshop: Introduction to Teaching QE

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Abstract. This workshop serves as an introduction to education in Quantitative Ethnography (QE) and is hosted by *Teaching (with) QE*, a Special Interest Group of the *International Society for Quantitative Ethnography* (ISQE). This year, we focus on educational programs for undergraduate and graduate students in higher education institutions. In the first half of the workshop, experienced presenters will discuss approaches, challenges, and best practices in QE instruction. In the second half, participants will engage in collaborative syllabus development in small groups alongside the presenters. The workshop is designed for researchers and practitioners currently involved in QE education, individuals considering implementing QE in their teaching, and learners seeking to deepen their understanding of the field.

Keywords: Teaching QE, QE education, Quantitative data analysis, Qualitative data analysis, Quantitative ethnography.

1 Introduction

Various educational initiatives have emerged with the increasing number of researchers and practitioners engaging in Quantitative Ethnography (QE). This growth has prompted discussions around effective teaching methods, appropriate curricular content, and assessment strategies. A wide range of learning opportunities related to QE has been offered to date, including workshops at international conferences (e.g., [1]), globally delivered QE Master Courses in 2023–2024 [2–4], and an instructor training program [5]. Educational resources aimed at broader audiences—such as podcasts, webinars, instructional materials, and translated video content [6–10]—are becoming increasingly accessible. However, formal academic publications documenting QE education within university and graduate school contexts remain limited [e.g., 11, 13].

This workshop is hosted by Teaching with QE, a Special Interest Group of the International Society for Quantitative Ethnography focused on applying QE in educational settings and developing related teaching practices. Our interests include instruction across contexts, teaching research, community-building, and interdisciplinary approaches. The workshop will emphasize formal undergraduate and graduate QE education, and offer a collaborative space for planning or designing teaching materials with educators, students, and scholars with QE experience.

2 Target audience

We welcome researchers, educators, practitioners, industry professionals, and students interested in QE education, particularly:

- Educators and teaching assistants designing or supporting QE courses
- Instructors integrating QE into other disciplines or curricula
- Researchers and industry professionals exploring QE's educational applications
- Students pursuing structured approaches to learning QE

This workshop focuses on formal university and graduate-level education. While other contexts (workshops, corporate training, challenges, doctoral supervision) fall outside our primary scope, participants may apply insights to alternative settings and engage in broader community dialogue after the workshop.

3 Workshop Structure and Activities

The workshop is structured to facilitate knowledge sharing and collaborative development over a two-hour session. In hour 1, organizers will host a panel discussion on QE syllabi with David Shaffer, Amalia Dache, and Amanda Barany, who will share their QE lessons learned (see Table 1). They will highlight key topics and essential assignments while addressing cross-cutting challenges and instructional successes. An open Q&A session will follow to set the stage for participant designs.

Hour 2 will involve hands-on collaborative work. Participants will form small groups to revise existing syllabi based on insights from presentations. These revisions will focus on addressing common challenges in QE education and leveraging successful practices. Groups are encouraged to consider diverse educational contexts and learner needs to ensure their revised syllabi can be adapted to a range of institutional settings. The workshop will conclude with a synthesis of key takeaways, a discussion on actionable next steps for implementing QE education, and opportunities for ongoing collaboration among participants.

Table 1. Existing syllabi.

Week	Barany's case	Shaffer's case	Dache's case
1	Course Introduction	ENA Introduction	Storytelling and Human Nature
2	What is Quantitative Ethnography?	ENA Deeper Dive	Foundations in narrative and ethnographic research
3	Applied Examples in QE	Qualitative methods	Folklore Studies and Oral History
4	Understanding an Epistemic Network	Segmentation	Collecting stories ethically and effectively
5	Cleaning and Organizing Data	Modeling	Qualitative narrative coding linked to folklore and ethnography
6	Structuring 1: Lines and Conversations	Coding	Visualizing Narrative Data
7	Structuring 2: Units of Analysis	Saturation	Coding Analysis: Thick and Thin Descriptions
8	Selecting Codes	ONA and TMA	Introduction to Quantitative Ethnography (QE)
9	Coding Tools and Techniques	Grounded analysis	Applying QE: Epistemic Network Analysis (ENA)
10	Assessing Validity and Reliability of Codes	Argumentation	Public Speaking and Presenting Narrative-based Data
11	Closing the Interpretive Loop – Interpreting and Disseminating QE Results	Current topics in QE	Disseminating and Publishing Narrative Research
12	Project Development (in class)	Peer review	Current Issues in Humanizing Data
13	Final In-class Presentations	What is QE?	Final Presentations

4 Workshop Contributors

Amanda Barany is a postdoctoral fellow at the Penn Center for Learning Analytics at the University of Pennsylvania. Her research integrates play-based learning, learning analytics, and QE methods to explore student motivation, identity, and achievement in digital environments. She specializes in automating qualitative analysis using large language models and has mentored over 30 QE scholars. She will serve as a panelist for the workshop, sharing lessons learned from her QE teaching.

Amalia Daché is an associate professor at the University of Pennsylvania whose work bridges storytelling and data-informed methodologies to explore educational access and AfroLatin American cultures. She delivered the 2024 ICQE keynote on “AfroLatin Futurism” and later developed Humanizing Data, an experimental course integrating narrative, qualitative rigor, and methods like Epistemic Network Analysis. She will serve as a panelist, inviting participants to consider QE as a tool for reimagining data through ethnography and cultural storytelling.

Ayano Ohsaki is a specially appointed associate professor at Shimane University. Her research focuses on learning analytics and human-centered design. Particularly in QE, she is currently developing computer-assisted qualitative data analysis methods. She also actively contributes to QE education in Japan. Her educational activities span multiple domains, including integrating QE into undergraduate data science curricula [11], researcher-oriented workshops, and industrial consulting. As co-leader of the Teaching (with) QE SIG, she will plan and organize the workshop.

David Williamson Shaffer is the Sears Bascom Professor of Learning Analytics at the University of Wisconsin-Madison and a Data Philosopher at the Wisconsin Center for Education Research. He has taught a course on the foundations of QE for many years, and is the author of *How Computer Games Help Children Learn* and *Quantitative Ethnography*. He will serve as a mentor and panelist for the workshop sharing lessons learned from his QE teaching.

5 Workshop Contributors

Our expected outcomes include the development of a model syllabus that can serve as a reference for QE educators and the identification of core components of QE instruction. During the workshop, participants will collaboratively revise existing syllabi. Through this process, they are expected to deepen their understanding of the essential elements of QE education and explore ways to integrate these elements into formal higher education curricula. Syllabi, readings, and other supporting materials will be compiled and made available for participants to take away from the workshop. In addition, the SIG leaders plan to publish the workshop outcomes on our website, making them accessible to participants and other stakeholders in QE education.

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Are Dining Reviews Conditioned by Cuisine?

An analysis of Asian vs. American Restaurants

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Abstract. This study investigates a restaurant’s cuisine shapes dining expectations by comparing customer reviews at Asian and American restaurants. Using 33,961 Yelp reviews from 71 restaurants in Santa Barbara, I use Epistemic Network Analysis (ENA) to uncover distinct patterns in customer evaluations. The results show that while food quality is universally valued, reviews of Asian restaurants tend to reflect a value-oriented perspective (e.g., money), whereas reviews of American restaurants emphasize a more experience-oriented one (e.g., atmosphere). These insights demonstrate how cuisine influence customer expectations and offer a novel application of ENA in hospitality research.

Keywords: Dining experience, Customer behavior, Online reviews, ENA.

1 Introduction

The United States is home to a diverse restaurant landscape, from fast-casual to fine dining, with Asian and American cuisines standing out as prominent and culturally distinct. As the industry grows—projected to hit \$1.5 trillion in sales and 16 million in employment [1]—meeting customer expectations is more critical than ever. In such a dynamic market, understanding the influence of culture on dining behavior is essential for both research and innovation in hospitality.

While previous studies have highlighted differences between Asian and American diners, less attention has been given to how the restaurant setting itself influences customer expectations. In other words, would the same customer expect different things when dining at restaurants serving different cuisines? To this end, I use qualitative analysis and ENA to examine online reviews. Our goal is to uncover patterns in customer experiences at full-service, sit-down Asian vs. American restaurants.

2 Theory

The Five Aspects Meal Model [2]—a widely used framework for analyzing customer dining experiences—categorizes the experience into five key dimensions: Atmosphere, Service, Food, Money, and Management. In this framework, a customer’s dining experience typically begins the moment they enter the restaurant (ATMOSPHERE). From

there, they interact with staff (SERVICE), enjoy the food and beverages (FOOD), and ultimately pay the bill (MONEY), with the overall experience shaped by the restaurant's operations (MANAGEMENT). Using this framework, a substantial body of research has consistently show that cultural background plays a significant role in shaping expectations. For example, when evaluating restaurants, American place particular importance on food quality, service reliability, and environmental cleanliness [3]. In contrast, I want to focus on an underexplored reverse question: Will the cultural background (cuisines) of the restaurants affect the customer's expectation/ reviews?

Traditionally, research on customer dining behavior has relied on structured surveys administered to a limited number of participating restaurants. While informative, this method restricts both scale and narrative of the data collected. In recent years, online review platforms like Yelp [4] have emerged as rich, natural sources of customer feedback. These platforms offer new opportunities for large-scale, naturalistic analysis, but the data are often unstructured and consist largely of free-form text. As a result, recent efforts leveraging this type of data tend to focus on surface-level metrics such as star ratings only [5]. I argue that qualitative text reviews should be analyzed in a way that shows how customers connect different aspects of the dining experience within their reviews. This is critical, as these aspects—such as food and price—are not experienced in isolation; rather, they interact within the broader context of customers' holistic evaluations and decision-making processes. To that end, I employ ENA to model how these aspects co-occur and interrelate (e.g., how often customers link food quality to price), providing a richer understanding of customer reviews.

3 Methods

Data. I extracted restaurant reviews from the Yelp dataset, focusing on full-service, sit-down restaurants in Santa Barbara—chosen for its balanced representation of Asian and American cuisines. Further filtering conditions included: (i) Reviews created after 01/01/2020; (ii) Restaurants with between 100 and 300 reviews, based on analyzing the review count histogram to exclude overly popular restaurants that could skew results. This yielded 35 Asian and 36 American restaurants, with a total of 2,510 and 2,397 reviews collected across each group, respectively. Long reviews were segmented into sentences for more granular analysis. The final dataset consists of 33,961 review sentences from 4,102 customers, covering two groups: A – Asian and B – American.

Codes are adapted from the Five Aspects Meal Model framework [1]. I removed the MANAGEMENT, as it rarely appears in the qualitative data. Coding was performed by a human coder alongside an automated coder using regular expressions. Details of the codes and the agreement between the two coders are provided in Table 1.

Analysis. I conducted a qualitative analysis to explore how customers express different opinions when visiting restaurants of different cuisines. Specifically, I closely examined individual customers who posted reviews for group of restaurants to see whether their comments are culturally conditioned. I also constructed an ENA model to compare different group of restaurants (i.e., Asian vs. American).

Table 2. Codebook for analyzing customer dining experience.

Code	Definition	Example	Cohen's κ
FOOD	Reviews related to the qualities of the food (e.g., flavors, ingredients, texture, appearance).	<i>"The noodles are so fresh"</i> <i>"Very dry and tasted like nothing"</i>	0.60
MONEY	Reviews that comment the value of the meal (e.g., price, portion sizes relative to price)	<i>"Pretty expensive for what you get"</i> <i>"The prices are very reasonable"</i>	0.62
SERVICE	Reviews that mention the restaurant staffs (e.g., professionalism, attentiveness, friendliness)	<i>"Awesome customer service"</i> <i>"No one check if we want more water"</i>	0.65
ATMOSPHERE	Reviews that discuss the restaurant's physical environment and vibe (e.g., lighting, seating)	<i>"The place was sparsely populated"</i> <i>"5 stars for cleanliness"</i>	0.60

4 Results

Qualitative Analysis. My qualitative analysis suggested that reviewers of Asian and American restaurants had different patterns of interaction among **FOOD**, **MONEY**, **SERVICE**, and **ATMOSPHERE**. To illustrate these patterns, I present two qualitative examples where the same customers gave roughly equal ratings to different groups—whether positive or negative—and closely look at their written reviews to see how they justify their rating based on four codes.

First, reviewer n5Sa rated 5/5 stars for both groups, however, in review for the Asian restaurant, they compliment the quality of FOOD that is value for the MONEY:

"A really amazing appetizer [FOOD]. Pricing was really reasonable [MONEY]." In contrast, when justify for the American one, they seem to enjoy the vibe:

"Steak was medium rare and juicy [FOOD]."

Place looks old school [ATMOSPHERE]. Service is quick! [SERVICE]."

Another reviewer, 0PJ9, gave low ratings to both groups (2/5). In their review, they cited food quality as the main reason for the Asian restaurant:

"What I got was a mostly-liquid, soggy, tasteless mess [FOOD]."

While for American restaurant, their dissatisfaction centered around the atmosphere:

"Clean up your store appearance [ATMOSPHERE]."

In another words, the qualitative analysis shows that: (1) FOOD quality is central to the dining experience, regardless of cuisine; and (2) Reviews for Asian restaurants tend to value the relationship between FOOD and MONEY; while Reviews for American restaurants place more emphasis on FOOD and ATMOSPHERE.

ENA Analysis. Fig.1 shows that FOOD is the most important factor shaping the dining experience—as evidenced by its central location in the graph. However, its interaction with other factors varies. Reviews of Asian restaurants show a strong

connection between FOOD-MONEY and FOOD-SERVICE, reflecting a value-oriented approach (Fig. 1a). In contrast, reviews of American restaurants highlight the connection between FOOD-SERVICE and FOOD-ATMOSPHERE, indicating an experience-oriented approach (Fig. 1c). The difference graph clearly shows that the connection between FOOD-MONEY in Asian restaurants' reviews is dominant, while the connection for FOOD-ATMOSPHERE is dominant in the American reviews (Fig. 1b).

Statistical analysis supports these findings: A t-test revealed significant differences between Asian ($M=0.12$, $N=34$) and American restaurants ($M=-0.11$, $N=36$), $t(67.21) = 4.76$, $p < .001$, $d = 1.14$.

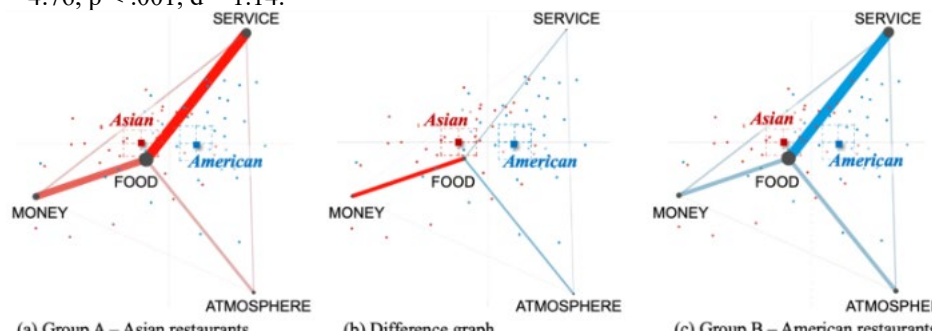


Fig. 4. ENA model for dining experience. (a) Mean network graph for Asian restaurants (red), (b) Difference network, (c) Mean network graph for American restaurants (blue).

5 Discussion

This poster explores how cuisines influence dining expectations through 33,961 Yelp reviews of Asian and American restaurants in Santa Barbara. While FOOD remains the central factor across all reviews, results suggest that Asian restaurant reviews frequently contain strong FOOD-MONEY connections, whereas American restaurant reviews emphasize FOOD-ATMOSPHERE connections. This poster is not without limitations. First, the geographic focus on Santa Barbara may limit generalizability. Second, the dataset lacks customer demographic information, which could provide insights into how cultural background of the diners influences their dining expectations. Nevertheless, this poster offers a promising pathway for applying ENA to analyze large-scale, online review data in understanding customer experience.

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Paraeducator Journeys in Mathematics

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Abstract. This poster shows how a mathematics professional development for paraeducators (a.k.a. teacher assistants, instructional assistants), resulted in a shift in attitudes and experiences towards mathematics.

Keywords: Mathematics, Identity, Professional Development, paraeducators, Epistemic Network Analysis, Discourse Analysis.

1 Introduction

In the U.S. students are not performing well in mathematics [2] – and there is a shortage of qualified teachers to support children in building their mathematics knowledge and problem-solving skills [5]. Research shows that adult attitudes towards mathematics is a strong predictor for student academic performance [6]. Critical to addressing this issue is providing mathematics professional development (PD) to paraeducators. This poster presents findings from interviews with PreK-grade 3 paraeducators who completed longitudinal autobiographical drawings representing their experiences with mathematics. The Epistemic Network Analysis (ENA) data demonstrates how and in what ways their attitudes to mathematics shifted before and after participating in a math PD called “Doing the Math with Paraeducators”.

The goal of this PD was to build paraeducators’ confidence, efficacy, and math pedagogical content knowledge by immersing them in doing math while introducing tools and instructional strategies for engaging in and analyzing math activities they do with children.

2 Methods, Data & Analysis

Data was collected from 20 paraeducators before and after they participated in a school-year-long mathematics PD totaling 35 hours. Before the PD, paraeducators were asked to create a Math Journey, an autobiographical drawing using pens, markers, and text bubbles to illustrate their prior experiences with mathematics. Afterwards in small groups they described their drawings, which were audio recorded, transcribed and coded. This process was repeated during the final PD session. The units for this data

were 20 individual paraeducators measured at two points (before and after the PD) and then nested in their schools of employment. The data was transcribed by a professional transcriptionist and segmented by sentences, resulting in 2171 lines of data.

Codes for the data were developed using an inductive coding approach guided by the discourse analysis of Gee [1] and the psychoanalytical theoretical framework of math identity which looks at "...how identities relate to emotions, anxieties, and sub-conscious desires [4]." Coding was done by two people through an iterative process of coding independently and then reviewing codes together to ensure interrater reliability. Additionally, the coding was reviewed together with two experts in math identity research. We achieved perfect agreement through the process of social moderation [3].

Table 1. Codebook

Code	Definition	Example
BAD	Any language expressing negative emotions or experiences. Any challenges associated with math learning, learning new methods, etc.	<i>My early experiences with math, I just remember it being really hard, just not being able to get it the way that it was introduced to me.</i>
GOOD	Any language expressing positive emotions or experiences related to math learning or teaching.	<i>Starting math in elementary school was good.</i>
LEARNING	When participant describes themselves in the role as a learner	<i>So once I started seeing all those patterns, I really enjoyed it.</i>
TEACHING	When participant describes themselves in the role as a teacher or describing their teaching practices.	<i>I work with elementary kids."; I'm learning myself as I teach them.</i>

2.1 Analysis

The data was analyzed qualitatively to understand the role of negative math experiences (code BAD) and positive math experiences (code GOOD) in relation to the codes

LEARNING and TEACHING. We also analyzed the typical recent temporal context, or “common ground”, which we determined qualitatively to be a moving stanza window of four lines. This means that for any given line, four sentences or previous lines of data is needed to understand what was said. We constructed an ENA model with units for pre- and post-interviews of 20 individual paraeducators which are nested in their schools of employment. The ENA model represented the connections between codes in each line of the data to other lines in its stanza window and summed the connections for all lines within each unit. The model normalized the resulting connection counts, and we used a means rotation comparing pre- and post-Math Journeys to project the normalized connection counts for units into an ENA space. We compared units of pre- and post-Math Journeys by examining their mean network graphs and using a paired sample t test.

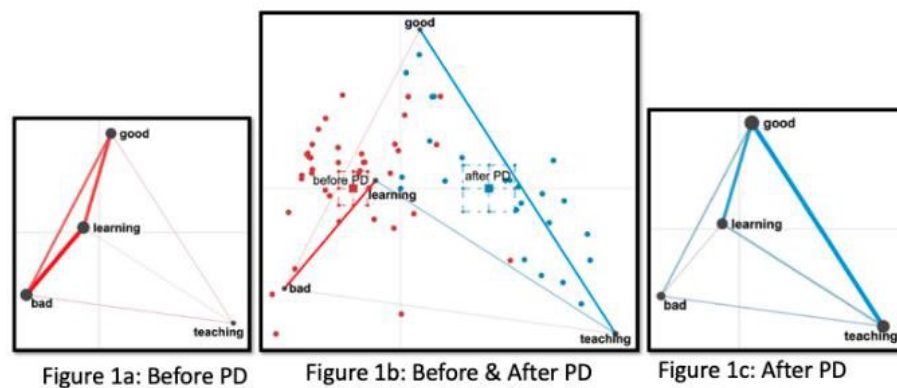


Fig. 5. ENA model showing (a) mean network graph, mean, and points for before PD group (red), (b) difference network comparing the before and after PD mean networks., and (c) mean network graph, mean, and points for after PD group (blue).

3 Preliminary Findings

Our qualitative analysis suggested that paraeducators Math Journey drawings before and after the PD had different patterns of interaction among the codes BAD, GOOD, LEARNING, and TEACHING. Before participating in the PD paraeducators shared many bad math experiences associated with learning experiences. For example, one paraeducator said: *“My early experiences with math[learning], I just remember it being really hard, just not being able to get it the way that it was introduced to me[bad], and then when I started elementary school, I started to get it a little bit, and in middle school it kind of went down.”* (line 10)

In contrast, after the PD, paraeducators reported having good, or positive math experiences when teaching math and using strategies they learned from the PD. *“Now that I’m coming into learning more of the math, getting math help, continuously getting the*

help, going back to school, having to teach it [TEACH], and now I'm more comfortable [good] (line 1421).

In other words, the qualitative analysis suggested that before the PD, paraeducators reported challenging experiences with mathematics mostly when learning. However, after the PD there was a substantial increase in good experiences, especially when teaching mathematics. This relationship is depicted in Figure 1a, where the mean network graph of units in the before PD group contains a strong connection between learning and bad. In contrast, Figure 1c shows the mean network graph of units in the after PD group, which contains a strong connection between teaching and good.

Using the difference network that compares the mean network graph between the two groups (Figure 1b), we identified the x-axis of the ENA space as characterizing the difference between connections to code BAD vs. connections to code TEACHING, the most prominent of which is connections between codes TEACHING and GOOD. Along the x-axis, a paired-samples t-test revealed a significant difference between the before PD and after PD interview response patterns, $t(45.29) = -9.31$, $p < .001$, 95% CI $[-0.71, -0.46]$, $M = -0.58$. When examining connections to code BAD vs connections to code TEACHING, the most prominent of which is connections between codes TEACHING and GOOD.

4 Discussion

There was a statically significant difference between paraeducator Math Journeys before and after the PD. Consistent with the psychoanalytical theoretical framework of math identity, paraeducators expressed either bad or good experiences with mathematics. Before the PD there was a strong connection between learning and bad, and after the PD this shifted to strong connections between good and teaching. While this work was based on Math Journeys conducted shortly after the PD, future work could investigate longer term impacts of the PD. This work shows that ENA can be used to gain insight into shifts in math attitudes and identities.

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In What Ways Do Different Communities Discuss Themes of Unity and Strife in the Black Community?

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Abstract. **Abstract.** This poster examines intra-Black racial dynamics through interviews with 375 Black American and Black immigrant college students, exploring themes of UNITY and STRIFE. Using Epistemic Network Analysis (ENA), we identify statistically significant differences in discourse patterns between groups. Black Americans often linked community with support and shared understanding, while African respondents emphasized verbal and intra-racial strife. These findings illuminate how ethnicity shapes perceptions of the Black community. This work offers a nuanced understanding of how Black students navigate belonging, identity, and tension within academic spaces.

Keywords: Quantitative Ethnography, Epistemic Network Analysis, Community

1 Introduction

By examining the co-occurrence of SOLIDARITY and STRIFE in the narratives of Black American and Black immigrant college students, this poster offers a nuanced exploration of intra-Black racial dynamics within higher education. This project is part of a broader research effort to interrogate how ethnic distinctions within the Black diaspora shape perceptions of community, belonging, and conflict. Rather than framing intra-group difference as inherently divisive, we approach these dynamics as sites of contested meaning-making shaped by intersecting histories, cultural perspectives, and lived experiences of racialization [1-3].

This work draws from educational and psychological research that challenges monolithic constructions of Black identity and emphasizes the importance of attending to both the fractures and solidarities that emerge across diasporic lines [1]. Existing research has frequently centered conflict among Black ethnic subgroups—focusing on

the role of colorism and differing historical experiences—without equal attention to the possibilities for unity forged through shared experiences of racial discrimination and structural marginalization [2]. This binary framing obscures the simultaneous and sometimes contradictory nature of intra-Black relationships, which may involve both coalition and contestation [1,-3].

Our analysis centers these complexities by resisting Western-centric research paradigms that flatten or pathologize intra-group difference. Quantitative Ethnography (QE) allows us to bring statistical meaning to the textured, qualitative insights shared by students [4]. Specifically, through Epistemic Network Analysis (ENA), we trace the ways that solidarity and strife co-constitute Black students' understandings of the Black community.

2 Data and Analysis

The sample ($N = 375$; 67.2% female; $M_{age} = 19.81$ years) consists of Black American and Black immigrant (African, Caribbean, or Afro-Latinx), college students from a 4-year institution in the Northeastern United States. The data consists of interview responses to the questions; “What does the Black Community mean to you”, “Have you experienced conflict in the Black Community”, and “Have you experienced solidarity in the Black Community”. This was collected in Fall 2019 and Spring 2021. 55.2% identify as Black immigrants and 40.5% identify as first-generation college students.

Nine codes were iteratively developed by reading the data (See Table 1). Coding was done using an automated coding tool called nCoder, which codes data using regular expression (regex) classification and validates levels of agreement. Modeling was completed using ENA, which specializes in identifying and quantifying patterns of connection in binarily coded qualitative data.

3 Findings and Preliminary Conclusions

The findings provide evidence of divergent discourse patterns across ethnic lines (Figure 1). Black American students (blue) showed the strongest connections between UNDERSTANDING and SUPPORT. This indicates that the most common instances of connected discourse referenced support and solidarity in events shared by the Black community. This can be interpreted as Black Americans viewing the Black Community as a source of strength, support, and mutual experiences in their lives. Whereas African students (purple) showed strong connections between VERBAL STRIFE and INTRARACIAL STRIFE. This indicates that the strongest connected discourse referenced instances of conflict within the Black community delivered in verbal ways. This can be interpreted as Africans in this study viewing the Black community as a space of strife and provides insights into the most common vessels through which African students experience conflict.

The Mann-Whitney U test showed these groups have statistically significant differences in their response patterns on questions about community, unity, and strife. Along the X axis (MR1), a Mann-Whitney test showed that **Black American** response

patterns (Mdn=0, N=155) were statistically significantly different at the $\alpha=0.05$ level from **African** immigrant interview response patterns (Mdn=0, N=66 U=6556.00, $p=0.00$, $r=-0.28$). In this study, Africans and **Black Americans** have contrasting perspectives and experiences within the Black Community. Through strong connections between unity codes, Black Americans regard the Black Community as more of a source of **support**, while for **African** students, it is more of a space of **conflict**.

These distinct meaning-making processes—shaped by students’ positionalities, migration trajectories, and culturally-situated understandings of Blackness—challenge reductive or homogenizing accounts of intra-Black relations. Rather than viewing Black communities through a binary lens of unity or division, this research urges scholars to consider how race and ethnicity interact in layered and often contradictory ways. Such an approach not only reveals the complex interplay between solidarity and strife but also demands methodological frameworks that are capable of holding nuance, tension, and contradiction. By centering the lived experiences of Black American and Black immigrant students, we move toward a more expansive and relational understanding of Black identity—one that resists flattening and honors the multiplicity within Blackness itself.

Table 1. Codebook

Code	Definition	Example	Cohen's K
SUPPORT	Evidence of uplifting others or feeling uplifted by members of the Black community.	"... people of color can feel welcomed and not judged by their skin color and help people become more confident..."	0.80
UNDERSTANDING	A shared solidarity based on common experiences and challenges, fostering mutual support and unity in actions and interactions.	"...It's a place full of others that understand the situations, trials, and challenges that you face..."	0.68
COMMUNITY	Spaces physical or hypothetical, or	"The club Men of Excellence (MOE) is	
SPACE	online where Black people are communing. The unified action taken in the face of	a perfect example of this....." "...various members of marginalized	0.55
CONDITIONAL RESPONSE TO CRISIS	racial injustices, fostering solidarity in the Black community.	groups came together to protest for BLM."	0.96
SHARED STRUGGLE	Coping with the same issues within and outside of the community	"A community filled with individuals willing to contribute to the world but are prohibited from doing so due to systemic oppression."	0.70
INTER-	Interactions of strife with non-Black	"...anti Black racism influence present	
RACIAL STRIFE	racial groups (Asian, AAPI, Latinx, Indigenous, White, Middle Eastern and North African)	in Latinx culture..."	0.81
INTRA-RACIAL STRIFE	Interactions of strife with other Black ethnic groups (Black American, African American, African, Afro-Latinx, Caribbean) Dominicans and Puerto Ricans)	"There have always been stereotypes facing Dominicans and their feelings toward Black people..."	0.69
EXCLUSION	Social exclusion based on skin tone/colorism/physical feature(s), social, cultural, racial, ethnic, political, religious categories or groups	"...many Latinx people don't like to consider themselves Black and are very prejudice"	0.93
VERBAL	Altercation involving an individual in	"I have seen Black students make fun of	
STRIFE	the BC including hurtful words and verbal remarks	first-generation Black immigrant students because they were different."	0.86

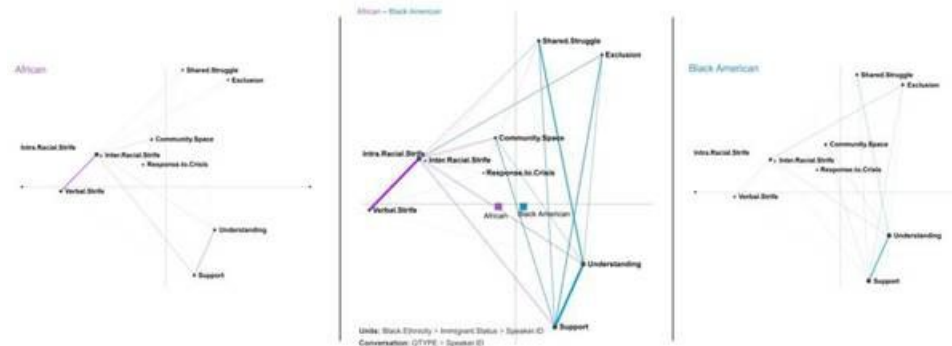


Fig. 1. ENA model mean network graphs, (right) mean network graph, mean, and points for Black American students (blue), (left) mean network graph, mean, and points for African students (purple), and (middle) difference network.

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An Epistemic Network Analysis of Structured Awareness-Raising Strategies Across Face-to-Face, Online and Hybrid Language Learning Contexts

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Abstract. This study investigates the language learning awareness of English as a Second Language (ESL) students in face-to-face, online, and hybrid education. Drawing on data from 250 undergraduate ESL majors at a Japanese university, the research explores which strategies are predominantly used by students, and how the mode of instruction may influence their strategic awareness. Using a coding framework based on the Self-Regulated Strategy Development (SRSD) model, and Epistemic Network Analysis (ENA), the study examines learners' awareness of approaches to learning, their awareness of facilities, roles and resources, and their awareness of self. Results show that the mode of instruction significantly affects how students articulate and connect different dimensions of learning awareness. While face-to-face learners put considerable emphasis on resource management and identity construction, online learners focus more on planning and self-reflection. Hybrid learners exhibit the most balanced awareness patterns across all domains. These findings highlight the importance of context-sensitive design to support self-regulated language learning and language learning awareness.

Keywords: Language learning, Language awareness, Computer-supported collaborative learning, Mode of instruction

1 Introduction

The landscape of language learning in higher education has undergone drastic transformations over the past decade, in part because instructional modes have changed quite notably, spanning face-to-face, fully online, and hybrid formats [1]. In order to understand the way language learning takes shape, and to determine whether different modes of instruction influence this process, it is essential to determine how learners navigate different learning spaces, how they collaborate with others, and how they make use of the resources available to them. One way of doing so is by looking at the development of learners' strategic awareness about their learning environment. This study focuses on three key aspects of language learning awareness: awareness of approaches to learning, awareness of facilities, roles and resources, and awareness of self [2].

Three groups of learners (N=250), majoring in English as a Second Language (ESL) at a private Japanese university took part in the study. The three groups were subject to the same curriculum, but took courses either in a full face-to-face mode, fully online, or in a hybrid mode. This study aims to answer the following research question: how does the mode of instruction (face-to-face, online, hybrid) influence ESL students' strategic awareness about language learning in a computer-supported collaborative setting?

2 Structured awareness raising and self-regulation

A structured awareness raising approach to language learning is fundamentally based on the premise that enhancing learners' explicit knowledge about language, coupled with conscious reflections about language learning and use, generally improves learning success [2, 3]. It involves learners sharing their ideas and interpretations about language, and actively participating in exploration and discovery. Awareness-raising activities often engage learners on both a cognitive and an affective level. Core awareness-raising principles involve fostering learners' awareness of various approaches to learning (through instruction, or by sharing experiences), raising their awareness of facilities, roles and resources (including those used by peers), and harnessing their awareness of self, including acculturation and their emotions around the learning process [3].

To measure and assess the effect of structured awareness raising, it has been found effective to look for the self-regulation strategies students develop and apply. The Self-Regulated Strategy Development (SRSD) model, which has been designed to “address the demands of writing on discourse knowledge, strategy use, self-regulation, and motivation” [4, p. 856] provides a suitable list of strategies and meta-strategies to consider.

3 Methodology

The current study draws on data from the English undergraduate program at Kanda University of International Studies, Japan (N = 250). All participants in this study were enrolled in an elective module designed to promote effective language learning strategies. The module aims to cultivate students' capacity to self-regulate through structured reflection, planning, and strategy use. Activities include weekly journal submissions, weekly learning advisor feedback, goal-setting workshops, and a reflection report.

For all participants, a peer collaboration forum was set up through Google Classroom, where they were encouraged to post weekly reflections and respond to each other's posts. Data were collected across three consecutive academic years, each with distinct instructional modes (face-to-face in year 1, remote online in year 2, and hybrid in year 3). The dataset consists of 1,088 student-authored posts and comments, tagged with source IDs and time stamps. An application programming interface (API) tool was used to scrape the data, with all participants providing informed consent.

Data was coded by three independent coders, based on the SRSD model, allowing for a nuanced exploration of how learners recognise and engage with strategic components within their learning process [4]. In this paper, only the three awareness phases described above were mapped, to demonstrate the different awareness levels of students

in different modes of instruction. The ENA Web Tool (version 1.7.0) [5] was used to measure both the number of occurrences and linkage between the different awareness phases, based on mode of instruction.

4 Results: Awareness of learning across modes of instruction

For the face-to-face cohort, awareness of approaches to learning was lowest out of the three groups (accounting for 29% of the coded data), while their awareness of facilities, roles and resources was highest (30%). They also spent considerable time developing an awareness of self (41%). For the online group, awareness of approaches to learning was highest (41%), while awareness of facilities, roles and resources was low in comparison to the face-to-face cohort (21%). Awareness of self was on par with the other cohorts (38%). For the hybrid cohort, students' awareness of approaches to learning declined (36%), while their awareness of facilities, roles and resources increased (26%). Both categories hovered between the means of the other cohorts. Awareness of self was on par with the other cohorts (26%). For each group, ENA graphs were generated to analyse how different levels of awareness interacted with one another (Fig. 1).



Fig. 1. ENA graphs of the three awareness phases (Approaches, Facilities, Self) across the cohorts engaged in face-to-face (left), online (middle), and hybrid education (right)

Three two sample- t-tests assuming unequal variance determined the degree of variance between graphs. The face-to-face cohort was statistically significantly different at the $\alpha=0.05$ level from the online cohort ($t(438.21)=-3.31$, $p=0.00$ over the X axis, and $t(637.67)=-7.27$, $p=0.00$ over the Y axis). The face-to-face cohort was partially statistically significantly different from the hybrid one ($t(453.20)=0.58$, $p=0.56$ over the X axis, and $t(414.96)=-4.40$, $p=0.00$ over the Y axis). The online cohort was statistically significantly different from the hybrid one ($t(358.86)=4.15$, $p=0.00$ over the X axis, and $t(439.17)=1.98$, $p=0.05$ over the Y axis).

5 Discussion and conclusion

The results show key differences between the cohorts as they give rise to their awareness of learning, with the face-to-face cohort and the online cohort showing the highest degree of variation. For the face-to-face cohort, resource management, and a

construction of self outweighs other strategies, and are well-connected to each other. In the online cohort, this is one of the least-connected triads. For them, more emphasis lies on planning and strategy use, which both tend to occur with resource management. While awareness of self often co-occurs with awareness of approaches to learning and awareness of facilities, roles and resources for the face-to-face cohort, the online cohort showcases awareness of approaches to learning, which it links to self, and, to a lesser degree, to facilities, roles and resources. The interplay of strategies shows that self-regulation is socially charged and that the dynamics between different strategies can shift [6]. This is in line with Zimmerman's [7] cyclical model of self-regulation, and provides empirical evidence on how the interplay between person, behaviour and environment, which Zimmerman sees as "triadic processes that are proactively as well as reactively adapted for the attainment of personal goals" (p. 15), are shaping SRSD for language learning.

These observations provide indications that the hybrid cohort, in many ways, finds itself at an intersection. Reviews on the matter [8] have shown that students often positively evaluate the possibility to connect with peers while being able to self-pace their learning, which also shows in the present data. It can also be seen that the online cohort, lacking time / space to synchronously meet with peers, used the online space to establish rapport but would need further support to manage resources in the same space [1].

The results showed that language learning awareness is not static but a dynamic and context-sensitive construct [7], meaning that structured awareness-raising interventions must be adapted to the specific learning environment. Pedagogical strategies that foster self-regulation, resource literacy, and identity-building should, therefore, be tailored to support the distinctive strengths and needs of learners in each instructional mode.

Disclosure of Interests. The author has no competing interests to declare that are relevant to the content of this article.

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Race on Film: Black & White Screenwriters & the Portrayal of People of Color

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Abstract. Since the beginning of film, roles for people of color have been imagined and perceived through the lens of White writers and filmmakers [9]. This research seeks to investigate the application of Quantitative Ethnography (QE) techniques in analyzing the intricate factors that arise when White and Black screenwriters depict people of color on film. Drawing upon previously written scripts and analyzing similar and derivative themes, I intend to assess how the race of individual writers correlates with how people of color are depicted within a screenplay and on film. To achieve this, I utilize various rubrics to evaluate racial themes through examining language, and known stereotypes related to African American identity and experience [4] [5]. This study aims to assess the correlation between *Sinners* and *The Woman in the Yard*, both released in 2025. This study seeks to analyze these similar horror films featuring Black main characters in familial situations and assess how similarly or differently White and Black writers depict the complexity of Black American identities and experiences.

Keywords: Film, Race Film, Screenwriting, Black Film, Blacksploitation, Ryan Coogler, Drama, Horror, Thriller, Box Office, Film Tropes, Racial Stereotypes, Film History, Character Dialogue, Racism, African American Culture

1 Goals of Research and Research Questions

The objective of this proposed research is to investigate how the racial identity of a screenwriter affects the depiction of people of color in films. The research aims to aid in understanding racial identity and its role in writing for the screen. Adopting an objective perspective on how two similar films released around the same time by writers of differing racial identities will help examine how these individuals depict Black characters' actions, language, and experiences through their differing lenses. Consequently, potential research questions include: (1) Are films by White writers accurate portrayals of the lives and experiences of people of color? and (2) Do these characters of color, written by White writers, speak and react authentically? and (3) Can a White writer accurately capture the nuances of culture and create a film that will be well received within these minority communities they are recreating?

2 Background of Project

Since the beginning of film, roles for people of color have been imagined and perceived through the lens of White writers and filmmakers, spawning a demand for Black-centered criteria to determine the value of creative work depicting the Black aesthetic [7]. Currently, as there is a push for AI to have broader use in the screenwriting process, it begs the question of the importance of authentic voice when writing characters of color for films. Throughout history, roles for people of color have been written solely by White writers. However, with the emergence of "Race Films" in the 1920s, Black filmmakers like Oscar Micheaux began to reclaim their voices and create characters and worlds representative of their authentic experiences [6]. But that did not stop White filmmakers from continuing to produce films of their own with people of color as central characters [3]. Many arguments have been made questioning the authenticity of the characters and the worlds in these films written by White writers [8].

3 Methodology

The data for this study was derived from the films being compared, focusing on emergent themes that appeared throughout the narratives. These themes were identified through both the spoken dialogue and the actions depicted on screen. To ensure a comprehensive analysis, all themes present in the films were ranked in ascending order based on their frequency of emergence. This ranking process allowed for the selection of the twenty most prevalent themes from each film, which were then used as the primary data for coding. This approach ensured that the analysis was grounded in the most significant and recurring elements of the films, providing a robust foundation for further exploration and interpretation.

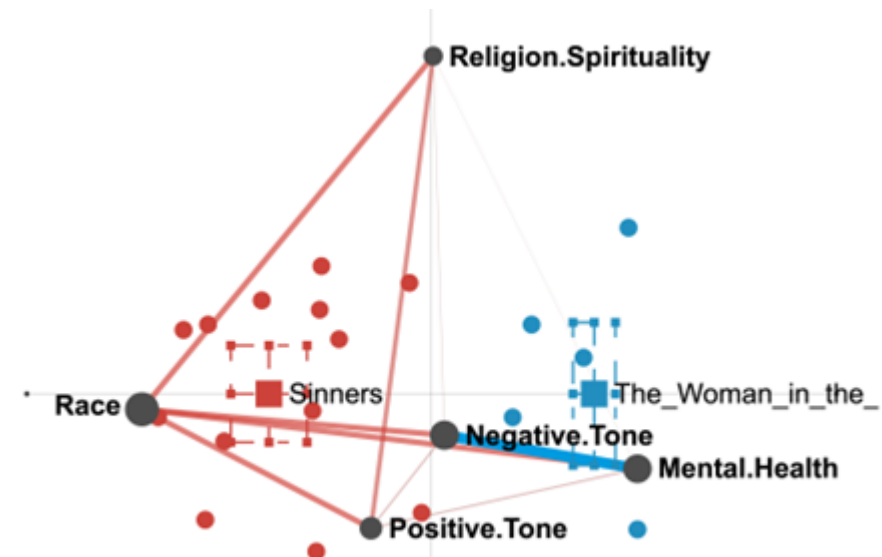


Fig. 1. ENA visualizations of themes in *Sinners* & *The Woman in the Yard*.

The analysis of the data involved conducting a content analysis, which was a systematic process of examining the selected themes (see Table 1). This was achieved by filtering the twenty most emergent themes from each film through two rounds of inductive categorization. These rounds were guided by a codebook, which served as a structured framework for organizing and classifying the themes (see Table 2). The codebook provided clear criteria and definitions for each category, ensuring consistency and reliability in the categorization process. By applying this method, the study aimed to gain a deeper understanding of the themes present in the films and to draw meaningful conclusions about their significance and implications.

Table 1. Themes.

<i>Sinners</i> [2]	African-American Culture, Assimilation, Colonization, Community, Cultural Appropriation, Cultural Preservation, Folklore, Freedom, Generational Trauma, Guilt, Love, Music, Oppression, Preservation, Racial Identity, Redemption, Societal Struggles, Spirituality, Undead/Vampires, Inescapable Past
<i>The Woman in the Yard</i> [1]	Adversity, Dark Thoughts, Depression, Death/Loss, Empowerment, Fear, Family Dynamics, Grief, Guilt, Healing/Forgiveness, Hope, Isolation, Motherhood, Personal Identity, Relationships, Resilience, Secrets, Supernatural/Ghosts, Suicide Ideation, Trauma

Code	Definition
Race	Concerning the condition of belonging to a racial group
Religion/Spirituality	Concerning a set of beliefs practices or rituals and/or concerning the human spirit or soul
Mental Health	Concerning psychological and/or emotional well-being
Positive Tone	Optimistic or favorable
Negative Tone	Pessimistic or critical

Table 2. Codebook.

4 Preliminary Findings, Expected Findings & Conclusion

Figure 1 illustrates the ENA model, which highlights the differences in network themes between *Sinners* (represented in red) and *The Woman in the Yard* (represented in blue). The QE analysis revealed that the film featuring Black characters and written by a Black writer exhibited stronger associations with race, religion, and spirituality, maintaining a positive tone. Conversely, the film, also about Black characters but penned by a White writer, showed deeper connections to mental health, with a predominantly negative tone. Both films portrayed a Black experience, yet only the one written by a Black writer explicitly addressed issues related to race. In contrast, the film written by a white writer largely overlooked race as a central theme for its Black characters, instead prioritizing mental health, albeit with a thematically negative perspective.

The application of ENA provides a structured conceptual framework for analyzing qualitative data, such as film scripts. By utilizing support codes, it is possible to outline similarities and identify variations in the differing approaches to writing Black characters and the Black American experience. Presenting the initial findings from this analysis and discussing them within the context of coding themes allows for a dynamic and comprehensive presentation of the data. Next steps will involve further refining the themes and coding each line of dialogue and action in each screenplay to determine which themes and codes are present in each. Additionally, exploring other

different genre film pairs will provide a more clear picture of how each approach to writing race for film compares and reflects the experiences of the subjects.

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How Independent Politicians in a Two-Party System Influence Political Framing: An Epistemic Network Analysis of Independent Australian MPs on Twitter

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Abstract. This study investigates how Independent Members of the Australian House of Representatives (N=10) used Twitter to frame political discourse in the year following the last Federal Election. As Independents have seen a rise in popularity in Australian politics, their digital communication strategies offer insights into how non-party actors frame issues and influence the political agenda. Combining thematic analysis and Epistemic Network Analysis (ENA), this research shows that Independents in Australian national politics can be subdivided into two dominant epistemic frames, a *Climate-Integrity* frame linked to the so-called ‘Teal’ Independents, and a *Community-Governance* frame, associated with grassroots Members of Parliament. This work highlights the value of ENA for understanding online political discourse and provides insights into how Independents influence political narratives in contemporary Australian politics.

Keywords: Political framing, Online political discourse, Epistemic Network Analysis, Australian politics, Climate, Community, Twitter

1 Introduction

The rise of Independent Politicians in Australia is at a high, with the combined vote share of the two major parties at an all-time low of 68% at the 2022 Federal Election [1]. Amid this political shift, Independent Members of Parliament (MPs) have leveraged social media, particularly Twitter (now known as X), as a platform to articulate issues, and differentiate themselves from the major parties [2]. In this evolving landscape, understanding how Independent MPs frame political issues and how those frames differ across individuals, offers key insights into how non-party actors shape public discourse. This research aims to understand the voice of independent politicians in Australia, by examining both shared and divergent thematic patterns in their Twitter messaging. By analysing recurring themes and how they tend to co-occur, political frames may emerge that can further explain the thematic nature of political speech.

Research Question: How do Independent Australian MPs frame issues on Twitter, and how does their framing of key issues align or diverge from other Independent MPs?

2 Epistemic Frames

Epistemic frames, first coined by Shaffer [3], are patterns of connections between concepts that reflect how people frame and understand issues. In this study, thematic co-occurrences in MPs' tweets have been analysed as epistemic frames, revealing not just what issues are being discussed, but how they are interconnected to shape arguments and construct a political agenda. Using Epistemic Network Analysis (ENA), these frames can be visualised, comparing how different Independent MPs construct their political narratives, and how they build a distinct political identity [2]. ENA is particularly suited for this analysis because it quantifies patterns of co-occurrence in discourse, allowing us to compare the structure and strength of connections across MPs key talking points. In combination with grounded thematic coding, this study shows that Independent MPs use social media not only as a broadcast tool, but also as a means to showcase and develop their values, legislative priorities and campaign strategies.

3 Data Collection & Methodology

Tweets were collected from all elected Independent MPs (N=10) using the Twitter Developer API, collating all Tweets, Retweets and Replies from the non-party affiliated independent politicians following the last Federal Election (from 22/5/2022 to 22/5/2023). This yielded 6,023 tweets, which were coded thematically using a grounded theory approach [4]. Codes were grouped into 26 overarching themes. Interrater-reliability testing was completed to ensure codes were representative across the two independent coders of the project, with an average Krippendorff's Alpha score of 0.92.

4 Findings: Emerging Epistemic Frames

Drawing on ENA [5], this section focuses on how independent MPs construct thematic frames through patterns of co-occurrences, seeing what unifies them, and where they diverge. In this research, two distinct frames emerge from the data, a Climate-Integrity frame, and a Community-Governance frame, as shown in Fig. 1.

4.1 Frame 1: Climate-Integrity

This frame is prevalent among the so-called 'Teal' independents, who are known to be more economically conservative but more ecologically and socially progressive, and reflects a campaign-driven discourse centred around climate action and political

reform. This tightly clustered network aligns with Vromen & Rutledge-Prior's [6] and Gauja et al.'s [7] earlier findings, who argue that the Teals' focus on issue-based campaigning not only shaped their electoral messaging but also influenced their agenda-setting behaviours in the post-election period. These MPs appear to use social media to reinforce a campaign-aligned identity, drawing on moral authority and political reform. An example of such framing has been included in Fig. 2, showing Independent MP Zali Steggall's online political discourse patterns.

4.2 Frame 2: Community-Governance

This frame is clustered in the right quadrants of Fig 1, centred around the themes Community, Culture & Society and Governance. It is associated with MPs that position themselves around local representation and service delivery, aligning with a grassroots political identity. This framing style shows non-party political actors' flexibility in issue prioritisation [8] on digital platforms that allow for direct engagement with audiences outside of dominant political narratives. An example of such framing can be found in Fig. 2, with Independent MP Dai Le sitting far from the thematic centre, indicating a distinct localised strategy and community-centred communication.

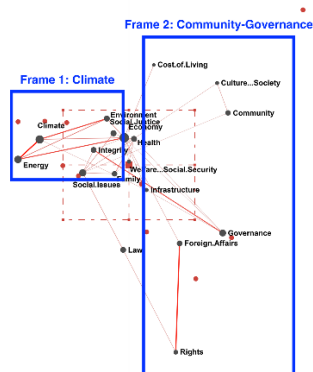


Fig. 1. ENA Graph (minimum line weight = 0.08), highlighting two key frames: frame 1 (left): Teal Independents' Climate-Integrity, frame 2 (right): Community-Governance Independents

These epistemic frames reflect ideological positioning and constituency priorities. As some MPs construct coherent frames around national policy issues (e.g. Climate), others use local, constituent-driven discourse, resulting in more dispersed networks (Fig. 2).



Fig. 1. ENA Graphs of two Independent MPs: Zali Steggall (left) and Dai Le (centre), and Comparison ENA (right) (minimum line weight = 0.08)

Understanding these frames allows us to infer not just what issues matter to Independent MPs, but also how they strategically link issues to build distinct political identities in the public sphere. Le, for example, shows strong connections between Culture and Society + Community (0.82), whereas Steggall shows strong frequencies in Climate + Energy (0.96). The comparative network shows clear delineations between the two MPs, with no overlap between Steggall's climate frame and Le's community-centric approach and highlights the role ENA can play in understanding the differing issue priorities in a distinct political group.

5 Discussion & Implications

The divergent frames reflect how Independent MPs can strategically construct political identities on a public online platform. Unlike major party actors who traditionally follow party lines and party politics, Independents are less bound by a centralised media campaign, PR teams or party narratives, giving them greater freedom [6]. Such freedom, however, can require them to use different framing strategies, informed by how they want to appeal to their constituents.

These findings show that issue framing on social media is a form of strategic identity work, not merely reactive commentary [8]. It also shows that Independent MPs construct coherent personas, and that framing select key themes is central to that process.

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

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Discourse Patterns in Virtual Team Conversations on Artificial Intelligence

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Abstract. This study explores how employees make meaning of artificial intelligence (AI) during a period of technological change at a global organization. As part of an internal initiative, virtual teams participated in guided conversations about AI. Using Epistemic Network Analysis (ENA), this research examined the discourse patterns that emerged across these conversations. The most prominent connections centered around AI Opportunities, Agreement, and AI Challenges, reflecting a dual awareness of both the promise and complexity of AI. Other frequently co-occurring themes included optimism about the future and alignment with organizational goals. This study contributes to growing research on workplace AI integration by surfacing how employees navigate emotional, strategic, and ethical dimensions of technological change through dialogue.

Keywords: Artificial Intelligence, Discourse, Epistemic Network Analysis, Workplace Well-being, Virtual Teams

1 Introduction

As generative artificial intelligence becomes increasingly embedded in the workplace, employees are faced with a rapidly evolving set of expectations, tools, and uncertainties. The adoption of AI in organizational settings often brings with it both enthusiasm and apprehension. Excitement about increased efficiency and innovation, but also concern over job displacement, skill relevance, and ethical risks (McRae et al., 2023; Gihleb et al., 2023). These dynamics affect not only workflows but also employee well-being and identity.

Research suggests that social connection and structured reflection can support employee adaptation during periods of technological disruption (Holt-Lunstad, 2018; Dutton, 2003). Dialogue allows individuals to process uncertainty, align with organizational values, and surface questions, hopes, and concerns in collective ways. This study aims to explore how those conversations unfold.

Specifically, this research investigates the following question: What discourse patterns and themes emerge among employees in virtual team conversations when discussing artificial intelligence at an organization expanding its use of AI technologies?

By analyzing these conversations through the lens of ENA, this study offers insight into how employees co-construct meaning during organizational transformation and how discourse can reveal collective tensions and alignments in the adoption of AI.

2 Methods

2.1 Data Collection

The dataset consists of three one-hour virtual conversations (5–15 employees each), hosted on Webex, focused on the topic of AI. Before the session, participants read a business article titled “Three Steps to Prepare Your Culture for AI” and responded to reflective pre-work questions. During the sessions, teams discussed their perspectives on AI’s potential impacts and how they personally and professionally relate to the topic.

2.2 Coding and Epistemic Network Analysis

A codebook was developed through grounded thematic analysis of the transcript data. Each segment, defined as a single speaker turn, was coded independently by two researchers. Coders then engaged in a process of social moderation to reach consensus on the final coding decisions. ENA was used to examine the patterns of co-occurrence between shared themes in the virtual team conversations (Shaffer et al., 2017). For this analysis, each speaker turn was treated as the unit of analysis, and each team conversation was treated as a separate conversation within the ENA model.

Table 1. Codebook of constructs used in analysis.

Code	Definition	Example
Positive Emotion	Expressions of happiness, contentment, enthusiasm, pride, or optimism.	"That would be awesome. Can you imagine? Just hit a button and then it just populates? Oh my God, that would be so cool. See now I'm excited."
Negative Emotion	Specific expressions or indicators of negative emotions, such as words or phrases signifying stress, anger, frustration, anxiety, or sadness.	"Ha. No, I put in chat 3.5 only because the amount of work that's going to be involved, it makes me trepidatious. "
Purpose	Meaningfulness, sense of achievement, alignment with personal or organizational goals, or discussions about the significance of the work.	"They use it and to be less, to be more like it can be used by people for inclusion, which I love. I love that idea."
Life Satisfaction	References to overall contentment with life, balance between work and personal life, or general well-being.	"So if we have, like an AI tool running on the background, whatever we are saying that's getting captured a little bit, and then we just have to edit it and send it out to make our life easier."
AI Opportunities	Instances where participants discuss potential benefits or positive impacts of AI in their roles or within the company.	"So I was thinking about, like, when we build out calendars for our programs, like, it would be so nice to have someone else just like cross track dates on holidays and like the timing."

AI Challenges	Instances where challenges or concerns about AI are discussed.	"I mean. Sorry guys, but for the point of view of language, right? Accuracy. It's still not where it should be. I don't know, Lola, if you've never said when it's, for German, but for example, for Spanish, when there is a translation tool, or."
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Discourse Patterns

3

Skill Development	Mentions of the need for new skills or training to work effectively with AI.	"I would say, critical thinking because to be able to, to take the information and actually figure out what is actually providing it to you."
Adaptation and Change	Instances of how roles or processes need to change to integrate AI.	"So it's out there. It's out there. And, companies are using it in a very effective and a fast manner. So we need to definitely adapt to the change."
Ethical Considerations	Ethical issues surrounding AI, such as bias, accountability, transparency, or the moral implications of AI decisions.	"It's being fed from things that are already on the internet, and those things sometimes are so biased and so politically wrong."
Future Outlook	Instances about the long-term implications of AI on the company, industry, or individual careers. This might include speculations, hopes, or concerns about the future.	"Certainly, I think one could view anyone in a content business. The generative AI could be viewed, as an existential threat."
Disagreement	When someone clearly says or shows they have a different opinion or view from someone else in the conversation.	"But I got us out of the meeting notes. You forgot that was the only like, I cut us out of it not have it, but. Okay."
Agreement	When someone clearly says or shows they think the same as someone else in the conversation.	"I agree with you Larry. I feel the same way."

3 Results and Discussion

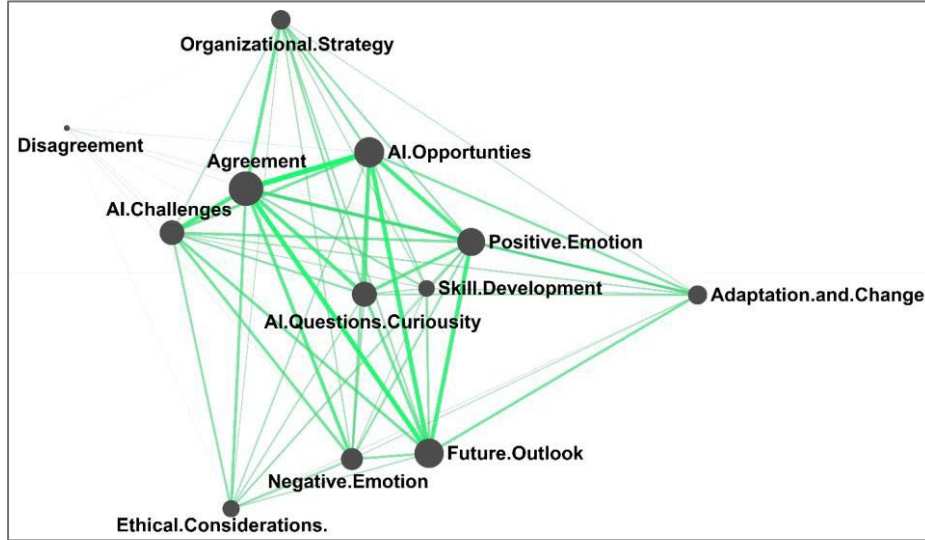


Fig. 1. All Teams Combined Epistemic Network Analysis Model

The ENA model (Figure 1) reveals that AI Opportunities, Agreement, and AI Challenges formed one of the strongest clusters in the discourse, suggesting that employees simultaneously acknowledged both the promise and complexity of AI while expressing alignment around its relevance to their work. This dual framing reflects the emotional and cognitive tension highlighted in the broader study. Employees held both curiosity and concern, often within the same conversation (Bankins & Formosa, 2023; Liu et al., 2023).

Connections between Agreement, Future Outlook, and AI Opportunities indicate that participants were optimistic and forward-looking, using the team space to align around long-term potential. These discussions demonstrated high levels of strategic engagement and hopefulness, supporting the idea that collective dialogue fosters a sense of shared direction and adaptability (Dutton, 2003; De Nev, 2018).

Although Negative Emotion and Ethical Considerations were present, they were less central to the overall network, suggesting that while concerns were acknowledged, the dominant discourse emphasized opportunity and alignment with the organization's strategic goal.

These patterns point to the power of structured team conversations to surface tensions, build alignment, and promote meaning-making during times of technological change.

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Patterns of Connection in Colonial History Amongst Different Global Regions

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Abstract. This poster explores the differing colonial histories of countries in South Asia and Southeast Asia using Epistemic Network Analysis (ENA). Our difference network shows statistically significant differences in historical patterns. South Asian colonies experienced colonial investment in trade infrastructure and a phased political transition, while Southeast Asia endured more exploitative resource extraction through plantation and mining. ENA visualizes and quantifies historical colonial trends by examining the co-occurrence of political, economic, and social factors across the regions.

Keywords: Quantitative Ethnography, Epistemic Network Analysis, Colonialism, History

1 Introduction

Colonialism has left a lasting global impact that continues to shape societies today. However, colonial histories vary and so do their lasting effects. In this exploratory analysis we show how ENA can be used to explore colonialism in two neighboring regions with very different colonial pasts and impacts on their local economy, politics, and religion. This poster focuses on visualizing a comparison between the connections between different facets of the colonial history of South Asia and Southeast Asia. South Asia consists of historical data from the colonized countries Afghanistan, Bangladesh, Bhutan, India, Sri Lanka, Nepal, and Pakistan. Southeast Asia contains historical data from Brunei, Indonesia, Cambodia, Myanmar, Malaysia, Philippines, Singapore, Thailand, and Vietnam.

By using ENA to examine the co-occurrence of various aspects of colonialism amongst global regions this poster offers an exploration of the differences in historical colonial experience. This project is part of a broader research effort to examine how different colonial systems shape current-day socioeconomic indicators. Our initial exploratory analysis provides a visualization and quantification of historical trends using ENA. Through this model, we will attempt to show what levels of political domination certain regions experienced through quantified qualitative factors.

2 Data and Analysis

The dataset used in this exploration consists of 83 countries from Africa and Asia which were categorized by 15 political, economic, and social factors, as codes, to capture the multidimensional aspects and impact of colonialism (Ziltener et al., 2017). As an example, for the code Plantations, each country was assigned a number 0-2. Zero was assigned to countries who didn't have plantations, 1 indicates little plantations, and 2 means extensive plantations. Only a subset of countries and codes were used for this preliminary analysis. See Table 1 for the subset of codes from Ziltener and colleagues used in this analysis.

The original dataset and codes were minimally transformed to enable ENA modeling. The process included converting categorical coding into multiple binary codes as well as conversion of ordinal scales to work in a binary ENA framework. For example, the code Plantations used in the following model was transformed binarily so that countries assigned 1 and 2 were just 1, and countries without plantations remained 0.

While our dataset is relatively flat and lacks the rich qualitative data often used in QE analyses, it is based on previous historical analyses of colonialism. Further, we take inspiration from Ruis, we argue that QE methods can develop thick descriptions of complex processes in the absence of rich qualitative data (Ruis, 2023). Additionally, our modeling efforts in this space can be coordinated with rich historical evidence or analyses in the future.

Table 1. Codebook

Code	Definition
STRONG TRADE EFFECT	50-100% of the colony's total trade is with the metropole.
GRADUAL POWER TRANSFER	A very gradual and planned transfer of administration
DISORDERLY POWER TRANSFER	A quick and disruptive transfer of administration
COLONIAL INVESTMENT	The dependence on direct investment from the metropole for colonies with a concentration of the effect being greater than 25%
PLANTATIONS	Colonies which contained plots of land owned by permanent resident families (of European descent), which produced for export and for local/regional markets, and employed many workers, but in smaller proportion to the total expenditure.
MINING	Extraction of natural resources such as oil, coal, iron, and others.

3 Historical Context

The following is a rough historical accounting of colonialism in these regions. Due to the rich collection of spices and textiles in South Asia, it became a hub for trade and profit for the British and they made significant investments in administrative and railway infrastructure aimed at enabling trade and control. It is important to recognize that these “investments” were not made with the intention of benefiting Indigenous communities but rather serve the economic and administrative goals of the colonial powers. It is also notable that this region experienced a relatively formal decolonization process after World War II, including the partition of India and Pakistan in 1947.

Southeast Asia, on the other hand, often saw exploitative arrangements aimed at extracting natural resources. For instance, the Dutch heavily exploited Indonesia’s land and people for plantations producing spices, rubber, and coffee, under systems like the Cultivation System, which enriched the Netherlands at the expense of local farmers.

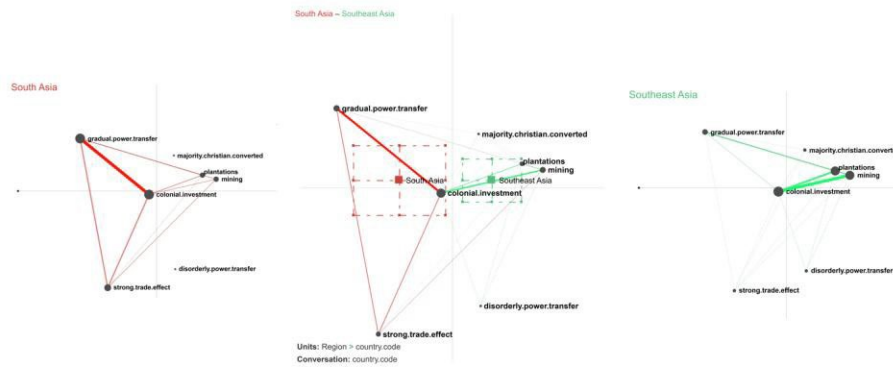


Fig. 1. ENA model mean network graphs, (left) mean and points for South Asia (red), (right) mean and points for Southeast Asia (orange), and (middle) difference network.

4 Findings and Preliminary Conclusions

This network model (Figure 1) visualizes the differing colonial legacies of **South Asia** (red) and **Southeast Asia** (orange) by mapping associations with the themes STRONG TRADE EFFECT, COLONIAL INVESTMENT, PLANTATIONS, MINING, DISORDERLY POWER TRANSFER, GRADUAL POWER TRANSFER, and MAJORITY CHRISTIAN CONVERTED (Table 1).

As we can see, South Asia shows thick connections between COLONIAL INVESTMENT, STRONG TRADE EFFECT, and GRADUAL POWER TRANSFER, suggesting a colonial history marked by colonial financial control in trade flow and a more formal, phased transition of power. In contrast, Southeast Asia is more strongly associated with PLANTATION, MINING, and COLONIAL INVESTMENT indicating a different colonial strategy focused on natural resource extraction. The central

positioning of COLONIAL INVESTMENT in the model suggests that the colonial experiences of both regions are spurred by a high concentration of financial control from the metropole. The patterns modeled by ENA reflect the well-documented historical realities discussed above. Along the x-axis (MR1), at the $\alpha=0.05$ level, a Mann-Whitney test showed that both regions had statistically significant different experiences in colonialism.

We now understand how to construct models of historical colonial patterns by drawing from the impacts of indicators of colonialism. Although qualitatively thin, this dataset can enable many different types of explorations and answer many questions about the impacts of colonialism. Using QE offers a valuable approach to analyzing this type of data, enabling deeper insights into colonial history.

We recognize that this poster is a secondary analysis, taking codes and definitions as is from the work done by Ziltener and colleagues. In further analysis, we will explore redefining the coding scheme and associating definitions to navigate the negative implications of economic factors such as investment and plantations within the framework of colonized institutions. Additionally, in future studies, we hope to bridge the connection between historical data and current-day socioeconomic measurements of wellbeing to visualize the long-term impact of colonialist institutions.

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Constructing the Ideal College Graduate: A Comparative Epistemic Network Analysis of Commencement Speeches from Leading Chinese and U.S. Universities

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Abstract. This study explores how universities construct the image of ideal college graduates through presidential commencement speeches delivered in 2024 at eight top universities in China and the United States. Epistemic Network Analysis (ENA) was employed to examine content emphases and compare patterns across cultural and institutional contexts. Preliminary findings suggest that U.S. presidents highlighted community engagement, global responsibilities, and openness and inclusiveness, while Chinese presidents emphasized perseverance, national responsibilities, and collectivist values. This cross-cultural analysis sheds light on how national narratives and leadership discourse shape educational ideals, revealing how universities symbolically position higher education to reflect and reinforce societal values and expectations.

Keywords: Commencement Speeches, Epistemic Network Analysis (ENA), Ideal Graduate

1 Introduction

As a form of discourse, commencement speeches are deeply rooted in a specific cultural context and symbolically represent societal values (Shaffer, 2017, p. 71). These speeches not only celebrate students' achievements but also convey what universities perceive as the essential qualities of an ideal university graduate. Previous research has shown that these speeches often emphasize themes such as leadership, social responsibilities, diversity and so on (Martín de la Rosa & Lázaro, 2022; Seol, 2023). However, how these themes manifest across different cultural and institutional contexts remains an open question. Given the distinct educational traditions, governance structures, and societal expectations in China and the United States, a comparative analysis of commencement speeches can reveal how leading universities in these two nations define and promote their visions of undergraduate education and future success.

As a result, the research questions of this paper are:

- How do university presidents at leading Chinese and U.S. institutions construct the image of the “ideal college graduate” in their commencement speeches?

- What are the similarities and differences?

2 Methodology

2.1 Data Collection and Organization Procedures

This study analyzed 2024 baccalaureate speeches from presidents of eight top-ranked universities—Harvard, Yale, Princeton, and Stanford (Garber, 2024; Salovey, 2024; Risgruber, 2024; Saller, 2024) in the U.S., and Peking, Tsinghua, Fudan, and Shanghai Jiao Tong (Li, 2024; Gong, 2024; Jin, 2024; Ding, 2024) in China—selected for their consistent excellence in national and international rankings and reputation. Notably, the Chinese presidents are all STEM scholars and members of the Chinese Academy of Sciences, while their U.S. counterparts come from a broader range of academic backgrounds, reflecting different leadership cultures. This research split each speech into individual lines based on sentence boundaries, using periods as delimiters. This resulted in 432 lines in total, and each line was treated as an independent unit of analysis, preserving its original chronological order without additional cleaning.

2.2 Coding Strategy and Development of the Codebook

This study adopted a hybrid approach combining deductive and inductive coding. The initial codebook was developed based on the Essential Learning Outcomes (ELOs) framework proposed by the Association of American Colleges and Universities (2011), which outlines core competencies cultivated through liberal education. While this framework served as the primary structure (deductive), several subcodes were modified or newly generated through iterative reading of the speeches to better capture recurring themes in the data (inductive). Specifically, the study structured the coding scheme into three parent codes and twelve child codes: Learning and Application (Disciplinary Knowledge, Interdisciplinary Knowledge, Lifelong Learning, and Knowledge Creation and Application), Social Responsibilities (School Spirit and Contribution, Community and Society, National Responsibilities, and Global Responsibilities), and Personal Qualities and Skills (Independent, Critical, and Creative Thinking, Hardworking and Perseverance, Openness, Inclusiveness, and Communication, and Challenging Spirit, and Problem-Solving).

2.3 ENA Analysis

Commencement speeches are symbolic texts through which university leaders express institutional and societal ideals. By mapping interrelated themes, ENA enables systematic cross-cultural comparisons and reveals how different universities construct the image of the “ideal college graduate.” The conversation variable is defined by the eight universities to ensure that different speeches remain independent from one another. The unit variables are “country” and “university”, allowing for comparisons at both national

and institutional levels. To reduce the risk of oversampling connections at the beginning and end of speeches, a moving stanza window with a size of 4 is now adopted, which ensures that local contextual connections are captured while avoiding an overemphasis on introductory remarks and closing statements.

3 Results and Discussion

The study employed the ENA 1.7.0 Web Tool for modeling, revealing a clear distinction between the two groups. Along the X axis, a Mann–Whitney test indicated a statistically significant difference between the United States and China at the $\alpha = 0.05$ level ($p = 0.03$), suggesting a substantial difference in network alignment between the two contexts.

Overall, the networks of both countries are driven by a small number of codes. The differences between the networks of China and the United States are highly significant. In terms of nodes and connections, Chinese universities place greater emphasis on hard work, perseverance, dedication, innovation, and interdisciplinary approaches, while American universities focus more on global responsibilities, openness, inclusiveness, communication, embracing challenges, and giving back to their alma mater. This reflects the repeated and simultaneous mention of these themes. The differences among universities within each country are also very significant. For example, universities like Peking University, Shanghai Jiao Tong University, and Harvard University show relatively balanced connections between their nodes. However, in universities like Tsinghua University and Yale University, it is visually apparent that some nodes are exceptionally strongly connected, while others have very weak connections, with several outliers. This indicates that some universities' speeches focus intensely on a few key themes, while others are more balanced and diverse in their themes.

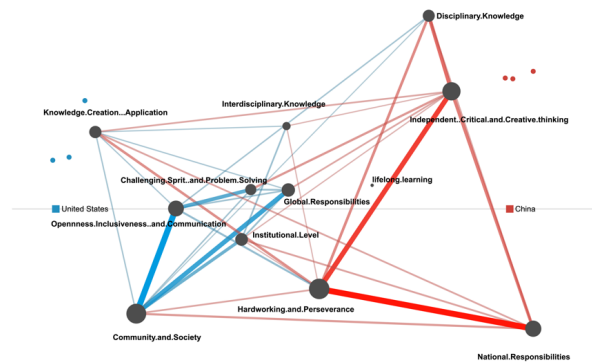


Figure 1. Comparative Analysis of U.S. (in blue) and Chinese (in red) Universities.

4 Significance and Implications

This cross-cultural analysis sheds light on how national narratives and presidential discourse shape educational ideals, revealing how universities symbolically position higher education to reflect and reinforce societal values and expectations. While commencement speeches have been widely discussed as ceremonial texts, few, if any, have employed ENA to systematically analyze how themes are interconnected and culturally situated. Beyond filling this methodological gap, the study also offers a scalable framework for future research—for instance, testing the approach across different types of institutions or tracing changes in commencement discourse over time to capture shifts in educational ideals.

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Leveraging Higher Education Institutional Supports for Non-STEM International Students in the U.S. Job Market

Tian Zhu

Abstract. Non-STEM international students in U.S. higher education face distinct challenges when navigating the job market, including limited work authorization, cultural and linguistic barriers, and a lack of access to informal professional networks. Unlike their STEM peers, they do not benefit from extended OPT periods or targeted employer pipelines, placing them at a systemic disadvantage. While higher education institutions offer generalized support through career services and academic advising, little is known about how these supports specifically address the needs of non-STEM students. This study investigates how institutional actors, including faculty, career advisors, and international student support staff, assist non-STEM international students in pursuing U.S. employment opportunities. The study incorporates interviews with institutional staff, faculty, and recent non-STEM international graduates to identify key support mechanisms and gaps. Data will be analyzed using a structured coding scheme to examine patterns in emotional, technical, and interpersonal support. This research highlights the need for more equitable support structures and targeted interventions to improve employment outcomes for non-STEM international students and ensure a return on their educational investment.

1 Introduction

International students face substantial barriers when entering the U.S. job market after graduation (Chow, 2020). These challenges are not only detrimental to the students' career prospects but also impact the U.S. economy's ability to retain global talent (Ruiz & Krogstad, 2019). Navigating the U.S. job market presents a unique set of challenges for international graduates, including entrance obstacles related to obtaining visa, linguistic barriers, and cultural backgrounds that are perceived negatively in hiring decisions (Lee & Rice, 2019).

National Foundation for American Policy (2022) found that non-STEM international students contribute significantly to the high tuition revenue generated by U.S. educational institutions but often do not receive the same return on investment as STEM students, particularly in terms of access to extended work opportunities and pathways to long-term employment in the U.S. Though higher education institutions often provide some sorts of support to all international graduate staying in the U.S through offices like Career Services, Academic Support, and Social and Cultural Programming (Nara et al., 2019), there is less evidence about how they support non-STEM students,

especially without the policy assistance (e.g., OPT; NFAP, 2022) that STEM students benefit from.

The purpose of the study is to focus on non-STEM students and examine how higher education institutions support them aspiring for U.S. jobs. The research question for this study is:

How do U.S. higher education institutions support international non-STEM students in navigating the job market, as evidenced through qualitative interview data with faculty, staff, and students?

2 Literature Review

International students in the U.S. face significant challenges securing employment, including visa restrictions, language barriers, and limited social networks (Lee & Rice, 2007; Chow, 2020). Visa policies such as the H-1B cap and the STEM OPT extension advantage STEM graduates with 36 months of work authorization, while non-STEM students only receive 12 months (Demirci, 2019; USCIS, 2024). This policy gap limits non-STEM students' time to secure employment, contributing to a lower return on educational investment. Linguistically and culturally, non-native English speakers often struggle with advanced academic and professional language, affecting participation and integration in the workplace (Glass et al., 2015; Culpepper et al., 2022). These barriers extend to social interactions, making it harder to build professional networks—a key pathway to employment in the U.S. where many jobs are secured through informal referrals (Callum & Lindsay, 2024; Sampan, 2024). While universities offer general career services, support often caters more to STEM fields (Tung, 2018; Martirosyan et al., 2019). Non-STEM students report a lack of tailored resources, such as field-specific career fairs or job-search workshops that address sponsorship realities. As a result, they may feel excluded from mainstream programming (Chow, 2020). Faculty mentorship plays a critical role, particularly in graduate education, where professors can help students access hidden job markets through referrals and professional introductions (Luo & Drake, 2013). When faculty are engaged, students benefit from targeted networking opportunities and career preparation aligned with their disciplines. In sum, non-STEM international students navigate a complex landscape of structural and cultural challenges with limited institutional alignment to their specific needs. Despite some promising faculty-led efforts, systemic disparities in support services—particularly when compared to STEM peers—persist. This underscores the need for more inclusive, field-sensitive, and policy-informed institutional practices to support non-STEM international graduates in the U.S. job market.

3 Research Setting and Participants

This study mainly adopts a qualitative interview to provide a comprehensive understanding of how higher education institutions in the U.S. support international non-STEM students in their job market search.

The interview participants will include three groups. First, faculty members from U.S. higher education institutions who have either successfully supported or demonstrated a strong willingness to support non-STEM international students in their career development. Second, professional staff members from relevant institutional departments—such as Career Services and International Student & Scholar Services—who have direct experience supporting international student engagement and employment pathways. From the student perspective, participants must be nonSTEM international students who are either currently enrolled in a U.S. master’s program or have graduated within the past two years. They should be actively seeking employment in the U.S. or have successfully navigated the U.S. job market within the last two years.

This interview explores faculty and staff observations of common obstacles, their own job search experiences, and their motivations for supporting international students. The questions also examine the strategies used to help students build professional networks, the barriers faculty encounter in providing employment support, and suggestions for how institutions can better assist

non-STEM international students in navigating the U.S. job market. It also explores non-STEM international students’ motivations for choosing their majors, awareness of job market challenges, and the strategies they have employed to prepare for employment in the U.S. The questions also examine the role of institutional support—such as career services, faculty guidance, and peer networks—in their job search, as well as the barriers they have encountered. Finally, the interview invites students to reflect on their experiences and offer advice to future international students pursuing similar paths.

4 Data collection and Organization procedures

For this study, the context of qualitative interview has been segmented into individual sentences, with each sentence representing one line of data. Moving windows variables 6 lines, segmenting by interview questions. Each answer will be treated as a distinct unit, allowing for comparisons between individual supports and institutional supports. This variable will categorize the data based on the type of support provided (e.g., emotional support, technical support, interpersonal support, publicly available support and faculty support).

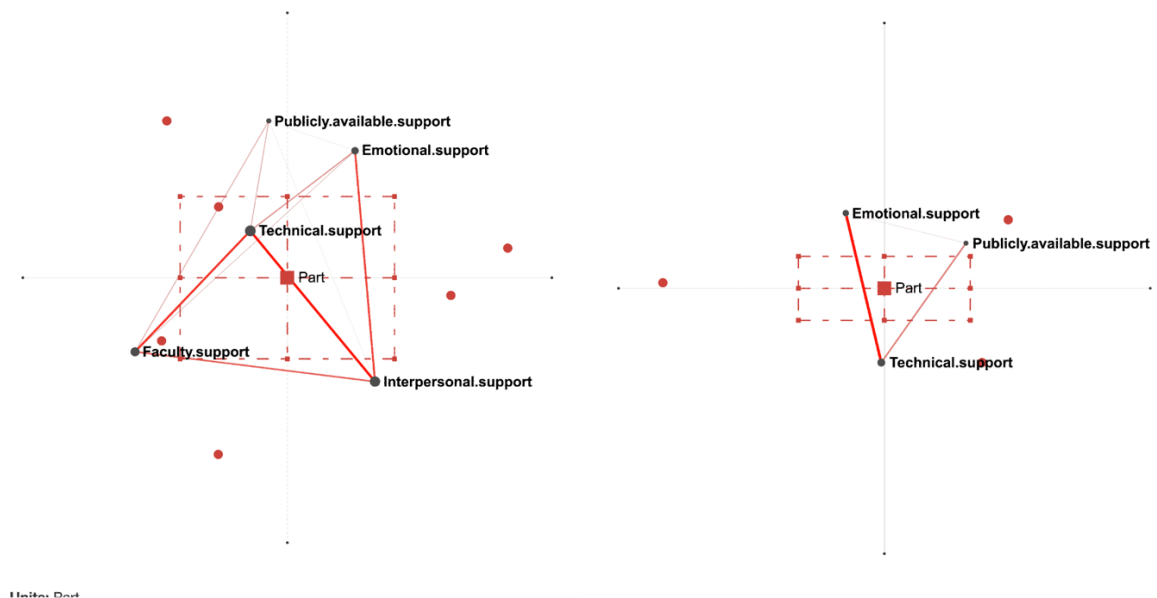
Table 1.

Parent Code	Child Code	Definition	Example
Institutional supports	Emotional support	Assistance related to students’ well-being, counselling	“I have applied for a half year gap due to personal burnout”

Institutional supports	Technical support	career-oriented workshops to students, CV review and mock interview	"I have been the Career Service to polish my CV and cover letter, but the advice is too general for me"
Institutional supports	Publicly available support	career center websites, workshop	"They have invited speakers from the industry, which helped me understand real-world applications of my academic work"
Individual supports	Faculty support	recommendation letter and personal resources	"The support from my professor was more crucial in the academia but not in industry"
Individual supports	Interpersonal support	networking with peers and personal referral	"Through one of the networking events, I met a few alumni"

4.1 Data Analysis Procedures

To analyze the interview data, a manual coding approach will be used, guided by a preestablished coding framework derived from existing literature. Each transcript will



be segmented into individual sentences, with each sentence representing one unit of analysis. This fine-grained level of granularity is chosen to capture the nuances of institutional and interpersonal support mechanisms and to maintain clarity in identifying support types. Using a moving window of 6 lines, each response will be treated as a distinct “stanza,” allowing for the co-occurrence of different support types to be visualized in subsequent epistemic network analysis (ENA). This method enables the detection of patterns across participant groups (faculty, staff, and students), and helps illustrate how different types of support intersect within the same conversational context. Each coded sentence will be categorized under five main support types: emotional, technical, interpersonal, publicly available, and faculty support. Data will be visualized through ENA to construct networks that reveal differences in support experiences between individual and institutional actors. To ensure trustworthiness, coding definitions will be refined iteratively, and inter-rater reliability will be calculated through double coding a subset of transcripts. Significance and Implications of Topic

This study contributes to a growing but still limited body of scholarship on how non-STEM international students in the U.S. navigate employment challenges after graduation. By focusing on institutional and interpersonal supports—particularly through faculty, staff, and student voices—this research sheds light on under-documented practices that can significantly affect nonSTEM students’ job outcomes. The findings are expected to reveal both promising support models and systemic gaps, especially as many institutions still prioritize STEM-oriented programming due to policy advantages like the OPT extension. The results will inform university administrators, career service offices, and policymakers about the urgent need for tailored, equitable services for international students in non-STEM disciplines. Moreover, the project elevates the voices of students often rendered invisible in dominant job market narratives, offering practical recommendations for designing inclusive institutional supports and advancing international student equity in higher education and employment.

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Code Masking: K-Partite ENA with Multi-Mode Epistemic Codes

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Abstract. This paper proposes the k-partite Epistemic Network Analysis (ENA) as a methodological solution to differentiate and integrate multi-mode epistemic codes for analyzing complex learning contexts. We first introduce a k-partite ENA method through the code masking feature available in the ENA webtool. We then demonstrate this method through a bipartite ENA for understanding collaborative argumentation. Finally, the theoretical assumptions and implications of k-partite ENA are discussed to emphasize the applicable research contexts of this methodological approach.

Keywords: Epistemic network analysis · K-partite network · Multi-mode network · Code masking

1 Introduction

Epistemic Network Analysis (ENA) [5] has become an important quantitative ethnography (QE) method to understand learning through modeling the patterns of co-occurring codes within naturally occurring activity streams. Most published ENA studies, however, presuppose a single analytic layer. That is, all codes, whatever their epistemic function, connect in one common network through a single analytical lens. However, in complex learning contexts, a mono-theoretical lens may prevent us from understanding the intertwined nature of the complex learning ecology [1]. On the other hand, adopting multiple analytical lenses could imply adopting multiple conceptualizations of learning, which forces all distinct epistemic aspects of learning compressed into a single plane

[7] and challenges the interpretation. For instance, in a collaborative argumentation context, where learners argue with each other to construct understandings towards a certain topic, we could attempt to understand the learning both from the perspective of what is being constructed (i.e., a constructivism perspective) and how learners converse (i.e., a social learning perspective). However, whether the collaborative argumentation is productive is not only related to “how dense the argumentative moves are” but also “what ideas are carried with the moves”. When these dimensions are collapsed into a

single ENA space, a dense web of argumentative moves may coincide with shallow conceptual development, or vice-versa.

Similar problems are also seen in Fang et al. (2024) when analyzing collaborative problem solving, attempting to resolve the differences between social engagement and epistemic engagement through NENA [2]. However, the social dimension of CPS is not necessarily epistemic, so Fang et al. (2024) do not display the social network but aim to model the epistemic network shaped by social engagement [2]. We, therefore, propose a k-partite ENA method that treats different codes that have different epistemic meanings as different modes within one epistemic network. This way, we can keep codes analytically separate while still revealing how they co-evolve. In this paper, we present a lightweight solution that is available on ENA webtool (<https://www.epistemicnetwork.org/>), code masking, as a way to (1) articulate the conceptual value of k-partite ENA for modeling multiple epistemic dimensions, (2) introduce the code-masking functionality available in the ENA webtool and (3) demonstrate an example of creating bi-partite ENA graphs for interpretation of complex learning contexts.

2 Code Masking in ENA

In the ENA webtool, the co-occurrence of all codes is used by default. Code masking is a visibility switch built into the Advanced Options (Fig. 1). Code masking allows us to mask any connections we do not wish to see in a model—without removing the codes entirely from the model—because there are often some connections involving that code we want to preserve while excluding others. In the context of collaborative argumentation, for example, code masking allows us to create subnetworks by only modeling the within-mode connections (e.g., Argument-Argument, Knowledge-Knowledge) or only the cross-mode ties (e.g., Argument-Knowledge). Formally speaking, ENA by default models the co-occurrence matrix, $S \in N_p \times p$ of the complete set of codes, $C = \{c_1, c_2, \dots, c_p\}$. Code masking allows a post-hoc selection operator that creates an induced substructure of S , S^* . By choosing the code pairs whose ties are to be retained one can keep only within-mode ties (i.e., principal submatrix on any subset of codes, right panel of Fig. 1), or keep only cross-mode ties (i.e., a k-partite projection, middle panel of Fig. 1), or preserve any custom pattern of connections. All subsequent ENA (e.g., centroid calculation, rotation) proceed unchanged on S^* , making masking a general mechanism for generating customized sub-network views without altering the underlying data.

3 Analysis Vignette: Bi-Partite Collaborative Augmentation

To further illustrate the code masking functionality, we here present an analysis vignette of the data collected from a collaborative argumentation activity with code masking. In this activity, seven university students worked together to

Code Masking:	On	Off	by: Weighted Model
Claim	☒	☐	☐
Ground	☒	☐	☐
Qualification	☒	☐	☐
Counterargument	☒	☐	☐
Integration	☒	☐	☐
Hypothesis	☒	☐	☐
Prediction	☒	☐	☐
Test	☒	☐	☐
Observation	☒	☐	☐
Evidence	☒	☐	☐
Comparison	☒	☐	☐
Conclusion	☒	☐	☐

Fig. 1. The left panel shows the default ENA co-occurrence network. The middle panel shows the code masking for showing the cross-mode connections of a bipartite network. The right panel shows the masking for one set of within-mode epistemic codes.

argue the differences between natural language and LLM-generated language in the context of a Turing-test-like game.

As both the structure of argumentation sequences and the justification of individual arguments determine how participants learn in collaborative argumentation, we established two separate code sets to code the recordings of participants' argumentation. Specifically, we adapted Toulmin's (1958) and Leitão's (2000) argumentation frameworks [4][6] to code argumentative behaviors into Claim, Ground, Qualification, Counterargument, and Integration to examine the structure of argumentation. Based on Lawson's hypothetical-deductive reasoning framework, we also identified Hypothesis, Prediction, Test, Observation, Evidence, Comparison, and Conclusion as another code set to examine participants' efforts in justifying their ideas [3].

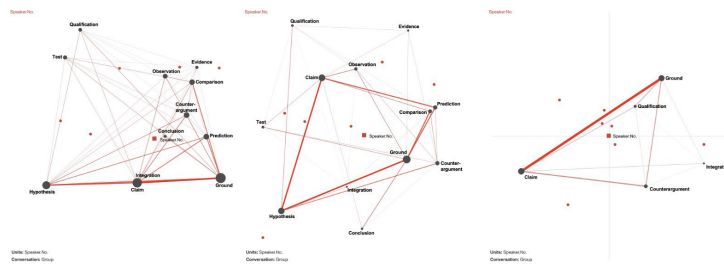


Fig. 2. The left panel shows the default ENA without masking. The middle panel shows the masking results for cross-mode for a bi-partite network. The right panel shows the masking results for a single sub-ENA for one set of within-mode epistemic codes.

The left panel in Fig. 2. shows the default ENA model of both structural codes and justification codes, which demonstrate the connections between Hypothesis (justification), Claim (structural), and Ground (structural). The middle and right panels of Fig. 2. show the bipartite network results. Specifically, the middle panel shows how the argumentative structures supports the justification of ideas (e.g., how Hypothesis is connected to Ground and Claim). The right panel, on the other hand, only shows the within-mode structural relationship of argumentative behaviors, providing a depiction of how learners argue.

4 Discussion and Conclusions

We want to highlight here that the masking (or creating k-partite ENA) is only as meaningful as the theoretical relationships indicate. Before hiding any tie, researchers should articulate why the corresponding sets of epistemic codes can or cannot be interpreted in the same network. Masking cannot compensate for ill-defined codes. Rather, it helps dive into complex but well-specified epistemic constructs. The vignette illustrated a bipartite case where two sets of epistemic codes co-exist in collaborative argumentation, but masking is not limited to two sets. By defining three or more code sets and selectively masking them, researchers can construct more generally k-partite ENA models. Future directions of research can look further into modeling the impact across sub-networks and how subnetworks co-evolve. In sum, code masking augments ENA with a lightweight path to k-partite network analysis. With a clear epistemic rationale, it promises finer-grained insights into how complex learning unfolds.

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Understanding Learner Preferences: An Epistemic Network Analysis of MOOC Participation Intentions

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Abstract. This study investigates learners' experiences with online education in a MOOC on social work education. Learners vary in their preferences for online versus in-person formats and in their willingness to take future online courses. Prior research has largely focused on general satisfaction or course completion metrics, overlooking the specific reasons behind learners' intentions to continue with MOOCs. Using survey responses from the course, this study compares reflections of learners who expressed interest in taking additional MOOCs with those who remained neutral. Epistemic Network Analysis (ENA) results show that those likely to continue emphasized flexibility and learning effectiveness, while neutral learners stressed the absence of interpersonal interaction and dissatisfaction with course delivery.

Keywords: Online Learning, MOOC, Quantitative Ethnography

1 Introduction

Massive Open Online Courses (MOOCs) have transformed higher education by providing flexible and accessible learning opportunities. As universities increasingly integrate online offerings into their curricula [1], understanding how learners evaluate MOOCs has become critical to improving instructional design and learner outcomes.

However, learner engagement and satisfaction in MOOCs can vary based on content, delivery methods, and individual preferences for online versus in-person instruction. Although MOOC research has expanded in recent years, much of it has emphasized on general pedagogical aspects or learner characteristics without systematically evaluating course effectiveness or learning outcomes [2]. These questions are especially relevant in fields like social work, where interpersonal engagement is a core component of both learning and practice [3]. Understanding learner experiences in this context can help address the challenges of adapting such relational disciplines to an online format.

This study addresses that gap by examining how learners reflect on their experiences in an online social work course and how these reflections relate to their intentions to take additional MOOCs. Specifically, we ask the research question that: How do

learners who are likely to take additional MOOC courses perceive and compare their experiences in MOOCs versus traditional face-to-face education?

2 Methods

Data used in this study came from post-course survey responses collected from participants enrolled in a MOOC on social work education. Responses to the question, “How likely are you to take additional MOOCs in the future?” were categorized into two groups, likely ($n=76$) and neutral ($n=13$), based on the distribution of responses across the original five-point Likert scale.

To compare learners’ preferences for instructional format, open-ended responses to the question comparing the course experience to in-person instruction were hand-coded into 8 codes. Codes were developed using a grounded theory approach by reading the data and identifying emergent themes (see Table 1). Given the relatively small dataset, manual coding was used to enhance accuracy and reduce the risk of misclassification. Based on the coded responses, an additional column was created to classify learners’ preferred format as online, in-person, or neutral.

Each response was treated as independent, and the conversation was set to independent users accordingly. The Epistemic Network Analysis (ENA) webtool was used to compare the co-occurrence of codes between learners who were likely versus neutral in their intention to take future MOOCs. We also compared differences by learning format preference within the likely group. Finally, a two-sample Mann-Whitney U test was conducted to test the statistical significance of differences between the groups.

Table 1. Eight codes used in the ENA model, grouped into four thematic pairs with positive and negative perspectives.

Code	Definition	Example
SELF-PACING_POS	Values flexible pacing and ability to manage their own schedule.	“Loved the ability to move through lecture slide at my own pace...”
SELF-PACING_NEG	Finds self-paced format difficult or demotivating.	“...It is easy to fall behind though.”
ONLINE_INTERACTION_POS	Appreciates opportunities for peer/instructor interaction online.	“I appreciated how we had discussion forums to utilize if we wanted to discuss with our fellow peers...”
ONLINE_INTERACTION_NEG	Prefers face-to-face communication over online interaction.	“Less interaction with peers.”
LEARNING_EFFECTIVE_POS	Feels they learned well or effectively online.	“I think I learned more online than in the classroom.”
LEARNING_EFFECTIVE_NEG	Reports difficulty learning or less effective outcomes online.	“I didn't get as much out of this course as I have with my face-to-face courses...”
DELIVERY_CONTENT_POS	Satisfied with content format and structure.	“It was an effective mix of discussion boards and video content...”
DELIVERY_CONTENT_NEG	Criticizes content delivery, structure, or accessibility.	“...It would have been good that the slides and transcripts had fewer

errors and are more structured and accessible.”

3 Results

Fig. 1 shows that positive nodes (i.e., SELF-PACING_POS, ONLINE_INTERACTION_POS, LEARNING_EFFECTIVE_POS, and DELIVERY_CONTENT_POS) cluster on the right side of the space, where learners who are likely (red) to take additional online courses show more frequent connections.

In contrast, negative nodes (i.e., SELF-PACING_NEG, ONLINE_INTERACTION_NEG, LEARNING_EFFECTIVE_NEG, and DELIVERY_CONTENT_NEG) appear on the left side, where connections are more prominent among learners who are neutral (blue) about taking future online courses.

Learners likely (red) to take additional MOOC courses show strong connections between LEARNING_EFFECTIVE_POS, DELIVERY_CONTENT_POS, and SELF-PACING_POS, indicating a positive perception of online learning’s flexibility, structure, and learning outcomes. Their connection to ONLINE_INTERACTION_NEG suggests that while they appreciate the benefits of MOOCs, they still value face-to-face interaction. For example, one learner mentioned that, “I get so much more out of face-to-face interactions since I find it so much easier to connect with people in real life, but given the convenience this online course offered., it has been ideal for my situation.”

In contrast, neutral (blue) learners show strong connections between ONLINE_INTERACTION_NEG and DELIVERY_CONTENT_NEG, showing their dissatisfaction with content delivery and a desire for more direct interaction with instructors and peers. These findings suggest that likely learners are driven by positive aspects of online education, whereas neutral learners are more influenced by its limitations. The two-sample Mann-Whitney U test showed that Likely (Mdn=0, N=76) was statistically significantly different at the $\alpha=0.05$ level from Neutral (Mdn=0.04, N=13 $U=203.00$, $p=0.00$, $r=0.59$).

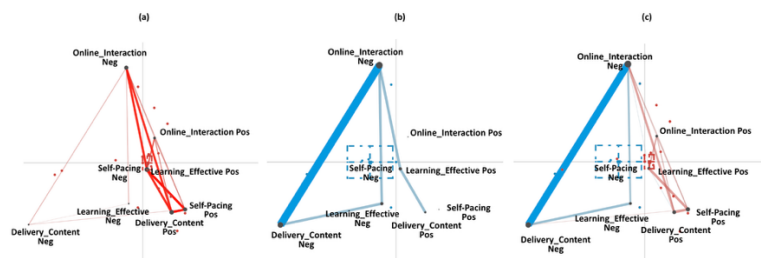


Fig. 6. ENA networks for future MOOC enrollment: (a) likely learners (red), (b) neutral learners (blue), and (c) their difference network (red and blue).

As shown in Fig. 2, among learners likely to take additional MOOC courses, those who prefer online (orange) learning show strong connections between Self-pacing_pos, delivery_content_pos, and learning_effective_pos, highlighting their

appreciation for flexibility and content structure. In contrast, those who prefer in-person (green) learning show strong connections between `online_interaction_neg`, `learning_effective_pos`, and `delivery_content_pos`, suggesting that although they recognize the effectiveness and quality of MOOCs, the absence of face-to-face engagement with peers and instructors drives their preference for in-person settings. This indicates that both groups value learning effectiveness but differ in how much they prioritize interpersonal interaction.

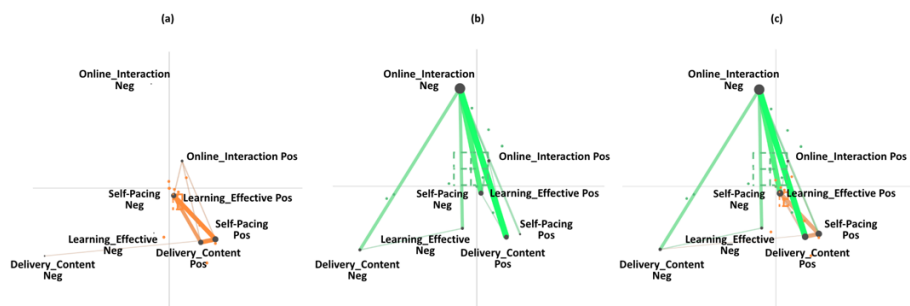


Fig. 2. ENA networks for likely future MOOC takers by learning preference: (a) learners preferring online (orange), (b) learners preferring in-person (green), and (c) their difference network (orange and green).

4 Conclusion

This study highlights how learners' intentions to continue with MOOCs are shaped by their perceptions of course delivery, learning effectiveness, and interpersonal interaction. Learners who are likely to take additional MOOCs tend to value the flexibility and structured content offered in online learning, while still acknowledging the absence of in-person engagement. In contrast, neutral learners emphasize dissatisfaction with content delivery and a desire for direct interpersonal connection.

In social work education, where interpersonal interaction is essential to both content and pedagogy, transitioning to an online format presents unique challenges. Although MOOCs expand access, they may limit opportunities for real-time communication and collaboration. Learners in such courses are therefore more likely to express concerns about missing in-person interaction, as reflected in the strong connection to `ONLINE_INTERACTION_NEG` observed in the data. This study underscores the importance of designing MOOCs that not only deliver content effectively but also foster meaningful interpersonal engagement.

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Comparing teachers' epistemic frames for supporting migrant students in Finland, Scotland and Sweden

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Abstract. This paper presents a study that applied Epistemic Network Analysis (ENA) to understand how teachers' Relational Agency (RA) - how they engaged with other actors to support migrant students' integration in schools - manifested across three different policy settings. The data was collected with online logs and interviews with teachers and other school staff from seven school sites in Scotland (3), Finland (2) and Sweden (2). ENA was used to construct teachers' epistemic frames that underlie their RA around migrant student support. Data was codes for alignment with the principles of Inclusive Pedagogy (IP). Countries were compared to identify any patterns that could be attributed to the differences in migrant student support systems. The findings demonstrate how RA manifested differently in different policy contexts. For example, teachers' RA was enabled by the more structured collaboration around migrant support in Sweden than in Scotland and Finland. We discuss the potential of ENA to capture the patterns in inclusive practices relative to the structures that enable or hamper RA.

Keywords: Migrant Education; Teachers' Relational Agency; Inclusive Pedagogy, Policy Implementation, Epistemic Network Analysis.

1 Introduction

We applied ENA to qualitative data generated in Teaching that Matters for Migrant Students, TEAMS project for short, to make explicit how norms and interactions that underly teachers' relationships with pupils, colleagues and other actors facilitate migrant students' integration in schools. TEAMS project conducted mixed-method analysis of data from three different educational systems that present different institutional conditions for teacher collaboration around migrant student support. This study focuses on the manifestations of teachers' Relational Agency (RA) in varying conditions that involve implementing and challenging norms. RA is analysed as teachers' epistemic frames that underlie their interactions around migrant support aligned to the principles of Inclusive Pedagogy (IP). The study has been designed to identify practices and policies that facilitate RA for addressing pupils' needs holistically focusing on learning, socialization and a sense of belonging in the school community. We applied ENA to examine the differences in teachers' epistemic frames across the institutional contexts.

2 Aim and research questions

The study aims to understand how teachers exercise agency to implement and challenge norms in different contexts that create different conditions for RA directed at migrant pupils' inclusion in schools. The research question are: What patterns can be found in teachers' RA across the different institutional contexts. Can these patterns be explained by any differences in policies around migrant student support?

2.1 Definitions of key concepts

Relational agency (RA). RA is defined as flexible working with other actors focused on solving issues for students [1]. We apply RA to teachers' work around supporting migrant students, for example, collaboration with language specialists and families. Depending on the availability of support systems, RA can manifest in the ways teachers implement existing policies, or work 'against the grain' to support all their students.

Inclusive pedagogy (IP). IP is a distinctive approach to inclusions that provides support for removing barriers to learning and participation, without labeling students who may need additional support [2]. For example, it relies on ways of working with specialists as a support to teachers to better understand how to support diverse students, rather than delegate responsibility for students who may need specialist support. We used IP principles as an analytical lens to interpret the interactions that reflect teachers' RA.

3 Methodology

3.1 Operationalization and data collection

To examine how RA manifests in teachers' interactions with pupils and their families, colleagues and other professionals or community members, we used Teachers' Reflection on Agency for Change (TRAC) log. TRAC is an online log for teachers that collects data on the norms and interactions that underlie RA. In particular, the log asked schools staff to describe in detail a "time (over the past 6 months) when they reached out to someone to support or help a migrant student". The log includes three sections as follows: the WHAT section asks teachers to report on the purposes of interactions (e.g. describe a situation in which they reached out to other actors for supporting a pupil); in the WHO section teachers report whom they reached out to and how they supported them (e.g. advice seeking, information exchange, or collaboration); and the WHY section invites teachers to reflect on the outcome of interaction – how it benefited them and/or the pupil, and how they perceive the contexts that enabled and/or created barriers. The log text was coded using coding schemes for assessing their alignment with the principles of inclusive pedagogy (Pantić, 2021; Pantić et al., 2022).

To facilitate interpretation of log data, a sub sample of staff were interviewed in each site about practices, collaboration and institutional arrangements around supporting migrant students to illustrate the content and contexts of interactions captured with the TRAC log. The samples in each site included diverse range of roles, men and women, different age, years of experience and in some sites staff who have migrant background themselves, including teachers of various subjects, management and specialist roles such as psychologists, student support, support for learning such as special educators and teachers of English/Swedish/Finnish as additional/second language. In addition, we reviewed policy documentation in each country focusing on migrant support systems.

3.2 Data analysis

The data was coded for the aspects of RA that underlie the log sections, including: beliefs about professional roles; nature of the interactions, and the perceived barriers and enablers of agency when supporting migrant students. Following the theoretical framework that combines RA and IP, the coding scheme distinguished between instances of staff working proactively and flexibly with others when supporting migrant students coded as ‘Agents of Change’ (AoC), e.g. where a teacher approached “many different persons to get help with the student’s issues”, and those coded as ‘Role-implementers’ (RI) when staff reported implementing existing policies and procedures, e.g. “Home were notified but students behavior remained the same and declined”. Importantly, given the situational nature of RA, acting as agents of change or otherwise is attributed to particular situations rather than the actors themselves, as the same teacher might act as an agent of change in some situations/contexts and not in others. IP codes indicated whether the nature of support aligned to the principles of IP (IP-positive) or not (IP-negative), for example whether specialist were used to include (as a support to teacher) or exclude students (e.g. by delegating responsibility to support staff).

Epistemic Network Analysis (ENA). We used the coded log data to construct teachers’ epistemic frames (e.g. based on co-occurrence of codes that IP, which can correlate with those of AoC or RI, depending on whether the reported interactions involved applying and/or bending existing rules and procedures. ENA allowed us to quantify coded qualitative data and identify patterns of discourse, actions, interactions, and beliefs that characterize a particular group. In ENA networks, nodes represent codes, and edges reflect the relative frequency with which those codes co-occur within the data (Shaffer, 2017). We used the codes generated in a pilot study (Pantić et al., 2021) that applied ENA to generate coding schemes and procedures to study teacher agency (TA) for IP. In this study we applied the scheme to the interactions around migrant support specifically. We analysed the coded log data using the R package **rENA** (Marquart et al., 2023). We configured our ENA models as follows:

- Units of Analysis: Individual networks were generated for each teacher, distinguished by teacher ID.
- Codes: TA_AoC, TA_RI, IP_Pos, IP_Neg, Enablers and Barriers (see above).

- Conversations: For each unit of analysis, the log data was segmented by Wave (data collected at three times/waves) and SchoolCode for cooccurrence identification.
- Window Size: The model used INF as window size which means the entire conversation being considered within the sliding window to construct a network.

To explore the dimensions of the ENA space and visualize differences between countries, we compared their mean networks using network subtraction graphs created by subtracting the edge weights of the mean networks for Scotland and Sweden to highlight co-occurrences that appear more frequently in one country than in the other.

4 Results

The plots show two dimensions – SVD1 and SVD 2 allowing the researchers to determine which dimensions explain the highest meaningful variance in the epistemic frames by examining the positions of codes along the dimensions of RA and IP.

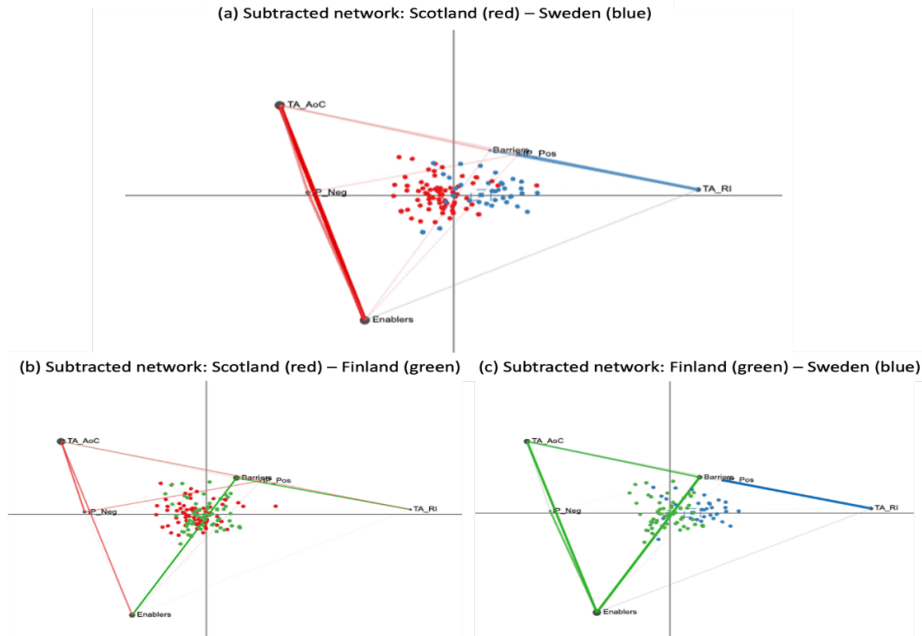


Fig. 1. Subtracted ENA networks comparing three countries

The Fig 1(a) illustrates high co-occurrence of ‘Teacher Agency for Change’ (TA_AoC) with ‘Enablers’ codes in Scotland (SC), compared to epistemic frames of teachers in Sweden (SW) where ‘Role-implementation’ code co-occurs highly with alignment to ‘Inclusive Pedagogy’ code (IP_Pos). Figures 1(b) and 1(c) illustrate the comparisons with the Finnish sample (FI) that show associations between TA_AoC with Enablers (as in SC) and Barriers, that display negative associations with IP. RA for positive IP was enabled by structured opportunities for teacher collaboration in

Sweden. Lessons for cross-policy learning focus on conditions that enable teachers' RA such as structural opportunities for collaboration with each other and with specialists.

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Conceptualizing and Quantifying the Future: Methodologies for Investigating Educational Imaginaries

Morten Misfeldt, Danielle Hagood, Adrienne Traxler, Daniel Spikol, Liv Nøhr and Cecilie Carlsen Bach

Abstract. In this poster, we address how to conceptualize and measure people’s “imaginaries” - that is dreams, visions, and concerns about the future, in relation to technological transformation of education. We build on data and experience from two existing projects. The first project is a survey ($N = 755$) investigating university teachers’ expectations and concerns about future scenarios of digitalization in higher education. The second involves a collaborative development process with mathematics teachers and compulsory school students ($N=34$), examining visions for the future of mathematics education in light of digital transformation and digital empowerment. Across both projects, we work with an underlying construct that distinguishes between desirability and perceived realism, using this to organize participants’ reflections and inputs about possible futures. In the poster, we will present a methodological approach that combines three essential elements for the qualified discussion and quantification of imaginaries: (1) internal coherence within each imaginary, (2) structured comparison across different imaginaries, and (3) iterative exploration and dialogue about these imaginaries. We argue that the integration of these three elements is crucial for robust assessment and informed reflection in the study of future visions.

Keywords: Educational Imaginaries, Mixed Methods, Comparative, Qualitative and Dialogical dimensions.

1 Introduction and Background: Why Investigate Educational Imaginaries?

Digitalization is heavily influencing education. Disciplinary knowledge about technology and computing has shifted from being a specialized concern in tertiary education to becoming a natural part of compulsory primary and secondary education. This change is driven by both projections of future labor market needs and an increasing recognition that democratic participation relies on knowledge about digital data and technology [1]. Furthermore, more and more work processes in the education sector are undergoing digital transformation.

It is broadly acknowledged that Implementation and change in education should not be solely imposed in a top-down fashion, but that sustainable change requires agency to be built with core participants [2]. The voices of teachers and students are therefore important to hear and consider. This is indeed done in most organizations, through codesign and evaluations. Long-term visions for the technological transformation is an important dimension, difficult to capture and put into practical use. Inspired by the “fu-

ture university project at Edinburgh University, we, in this poster, build a first attempt on a framework that allows us to combine qualitative and quantitative data about teachers' and students' work with educational technological imaginaries, and address the research question: How can we conceptualize and measure teachers' and students' dreams, visions, and concerns about the future of digital teaching. In this extended abstract use two specific projects to develop and discuss a methodological framework for studying such imaginaries

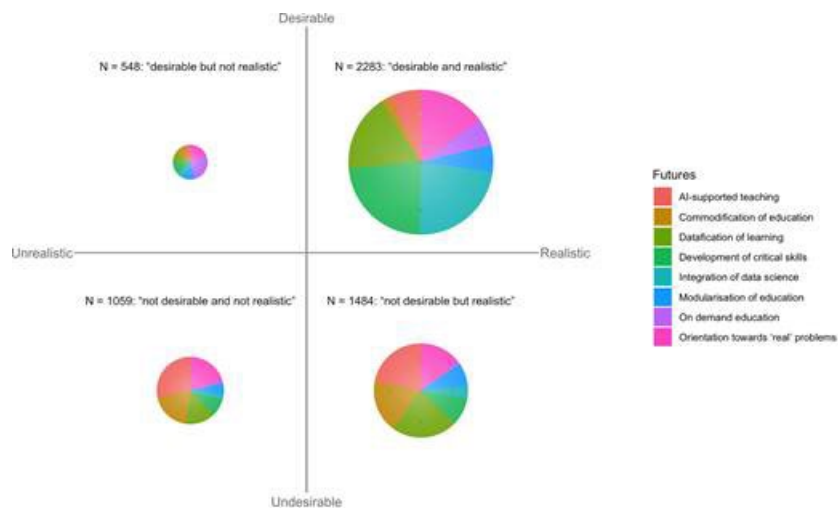
2 State of the art

In education, futures-thinking fosters critical citizenship and agency. Sociotechnical imaginaries and foregrounds [3,4] show that students' hopes and fears reflect social contexts and power relations. Participatory methods like Future Workshops [5] enable students to co-create desirable futures, while the Socio-Scientific Issues tradition highlights how engaging with real-world controversies helps imagine and evaluate scenarios. Researchers use narrative inquiry, argumentation analysis, and dialogic methods to reveal connections to democratic participation and social justice.

In media and technology studies (STS, media studies), future visions are seen as performative: shaping innovation and policy. Sociotechnical imaginaries help track how visions circulate in media, policy, and public discourse. Methods include discourse and content analysis; mapping how cultural narratives legitimize or contest dominant futures. In technology design, future-making happens through prototyping and participatory design. Future Workshops connect critique, utopian thinking, and implementation, while design fiction and scenario building integrate visions directly into innovation. Methods like scenario-based assessment and user-centered evaluation ensure alignment with diverse futures, acknowledging that visions are dynamic, value-laden, and locally shaped.

3 Case Studies

In a study of university teachers in Denmark, 755 participants shared their perceptions of AI and digital transformation in higher education [6]. A key tension emerged between ambitions to solve real-world problems and the pressures to maintain traditional academic structures. The work departs in the near future teaching work from Edinburgh university [7], but with a clear quantitative reorganization. In another study inspired by [7] we developed twelve "tarot cards" featuring speculative educational scenarios. These cards were designed to provoke teacher reflection on the digital future of mathematics teaching [8]. During a workshop in August 2024, three teachers evaluated the scenarios as "dangerous" or "cool," and "realistic" or "unrealistic," before crafting their own vision cards to express their hopes. The cards were also tested in two 5th grade classrooms, where students discussed which scenarios were "cool" or "uncool," realistic or not, and why.



Teachers noted that students' critical engagement with the tarot cards and scenarios offered valuable perspectives on the relevance and challenges of integrating TC into mathematics for example it surfaced nuanced visions and tensions—between automation and creativity, between support and surveillance—revealing how both teachers and students imagine and measure the future of mathematics and technology in schools.

4 Cohesion, Comparison and Iteration as approach to study imaginaries

At its core, any vision of the future is inherently unclear, uncertain, and, in a sense, under-determined. As hypotheses, such visions will most likely not withstand the test of time. However, the ability to think through possible futures from multiple perspectives remains valuable. We argue that future-oriented conceptions should be evaluated based on their internal coherence as well as their capacity to surprise, to offer eye-opening insights, and to broaden perspectives. Accordingly, we propose an approach—cutting across both data collection and analysis—that emphasizes a broad grid of perspectives and supports a qualitative (or at least interpretive) assessment of various future scenarios based on these criteria.

We propose a two-step model for evaluating future scenarios. First, each scenario should be assessed on its internal coherence and explanatory power. Second, a comparative evaluation should be conducted by placing scenarios side by side. In previous

work, such as the Futures of Digital School project, we found that prematurely categorizing visions as either desirable or realistic limited their interpretive value. To be meaningful, visions of the future require both detailed, coherent descriptions and explicit engagement with value-laden concerns. Our evaluation framework thus combines internal coherence with structured comparison. The four-quadrant model—desirable/realistic vs. undesirable/unrealistic—offers a useful comparative ground, but within each quadrant, thorough analysis remains essential. At the conference, further data and analysis will be shown to exemplify the approach.

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Undergraduate Design Students Perception of a Summer Research Mentoring Program

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Abstract. This study examines undergraduate design students' perceptions of their participation in a summer mentoring research program through semi-structured interviews with four participants. Using Epistemic Network Analysis, we examined how students conceptualize key elements of their academic self-concept developed during the program. Students reported growth in collaboration, confidence, and technical skills while developing an augmented reality application. Findings highlight the role of mentorship in fostering both technical competence and academic identity. Positive peer and mentor support promoted confidence, validated students' contributions, and enhanced readiness for professional and research settings. This study underscores the value of undergraduate research experiences in advancing students' academic and personal development.

Keywords: Undergraduate Students, Mentoring, Epistemic Network Analysis.

1 Introduction and Related Work

Undergraduate research experiences positively influence students' academic and professional development, fostering interpersonal skills, inquiry, and career aspiration [1, 2]. These experiences also encourage alignment between academic learning and career aspiration. Yet, in teaching-focused institutions, questions remain about how effectively mentorship-based research programs address undergraduate needs.

This poster evaluates the effectiveness of a mentorship-based research program at a teaching-focused institution, with attention to students' perception of their academic self-concept and professional readiness. Guided by Self-Concept theory [3], we examine how students identified program components that align with their academic and professional interests. Academic self-concept—how individuals perceive their identity and motivation in academic contexts [7, 9], has been shown a strong correlation with students' career aspirations, making it a relevant framework for understanding the program's impact [4].

To better capture both internal and external aspects of perceived growth, Epistemic Network Analysis was applied to analyze the semi-structured interviews. This approach enables the visualization of how students articulate their development and reveals

mentorship structures that support growth. This study also identifies areas for improvement to strengthen mentorship initiatives and foster supportive educational environments.

2 Methodology

2.1 Data Collection and Development of Codes

Semi-structured interviews were conducted with four out of the five students who participated in a summer research mentoring program at a teaching-focused university. All participants were graphic design majors with a minor in video game design; three were seniors and one was a junior. Interview questions prompted students to reflect on their experiences in the program and their broader college experiences.

Six inductive codes were the framework of self-concept. That posits one's perceptions shaping within a specific social context [9]- in this case of study, the university's summer mentorship program. Codes representing contextual influences included "*Advanced Technology/Resources*," "*Support*", and "*Challenge*." Additionally, "*Interpersonal Growth*" reflects and extends the crucial element of the framework, and "*Self-Efficacy*" [8] refers to the students' assessment of their ability and growth in executing specific tasks and subjects. The constructs "*Isolation*" and "*Career/Academic Aspiration*", complement this by capturing the emotional and motivational shifts students experienced. Coding was completed manually by two coders, achieving a Cohen's kappa above 0.75 through social moderation.

2.2 Epistemic Network Analysis

ENA was used to model the frequency and co-occurrence of the codes [10], visualizing thematic associations and how these constructs relate to research experiences. To better understand the nuances and complexity of each's learning trajectories, the comparison between students were analyzed. Based on centroid positions, which indicate the relative emphasis of themes within each participant's network, we identified one pair of students whose networks showed the greatest difference in the construct. This comparison provided a focused lens for examining variations in how students experienced and valued the mentorship program, enabling targeted recommendations for enhancing institutional support for student learning and research engagement.

3 Preliminary Findings

All participants highlighted positive *Interpersonal Growth* through the mentorship program, though they connected to different aspects of their experience. For three students, this growth was closely linked to *Academic/ Career Aspiration*, reflecting applied learning. In contrast, one participant focused more on the effective *Support* from mentor and peers, underlining the emotional encouragement the program provided.

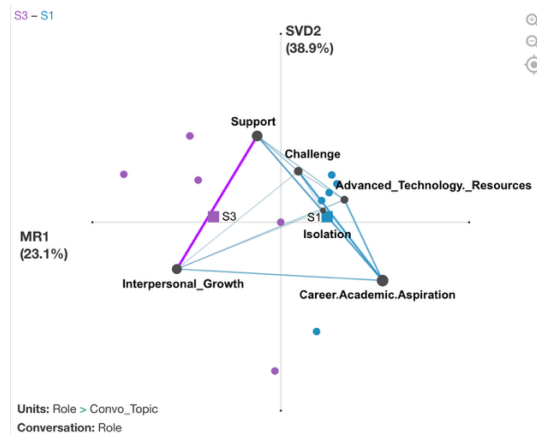


Fig. 1. ENA model showing difference network between Student 1 narratives of research experiences (S1, Blue) and Student 3's (S3, Purple)

Figure 3 presents a comparative model between Student 1 (S1) and S3, rotated along their respective means. This statistical result indicates a divergence in the distribution of constructs, suggesting that two students emphasized notably different themes among the reflections. It also highlights their contrasting ways of meaning-making within the same discourse.

While Interpersonal Growth remains as the central theme, S3's network indicates a strong connection with Support, with weaker associations with aspirations or technology use. This pattern suggests that S3's perception of this mentorship experience was more emotionally anchored, focusing on the support he received from both mentor and teammates. As S3 reflected,

"I always kind of worried that I wasn't going to be good enough. But most of the time, it was just me overthinking, while all my team members were very nice and trying to be very helpful with me, especially when I was learning."

This sentiment was reinforced by their appreciation for a supportive, inclusive, non-pressured environment:

"[the mentor] usually would check in with us [she said] 'don't put too much pressure on yourself to make everything perfect.' And it was kind of a nice change of pace to not expect perfection out of a school project. It's more viewed as a learning experience [to me] ... you are allowed to make mistakes."

4 Discussion and Implications

Participants described a progression from initial hesitation and self-doubt to viewing themselves as capable, emerging researchers. Growth was most evident in problem-solving, team communication, and ownership of contributions, initially rely on prior coursework to gauge readiness, students later connected skill development to career aspiration. This experience strengthened self-efficacy as they drew on prior knowledge

and background to contribute meaningfully [8], underscoring the transformative potential of research in a collaborative, supportive environment.

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Epistemic Network Analysis to study Transformative Learning while teaching Robotics in elementary STEM Education

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Abstract. This study explored how robotics teaching fosters transformative learning for teachers and supports students' cognitive, social, and identity growth. Using Mezirow's Transformative Learning Theory, the Robotics Teaching Framework, and ENA, interviews with three instructors showed that robotics encouraged teachers to critically reflect on challenges, shift their pedagogical identity, and adopt new perspectives, while students developed persistence, collaboration, and confidence as active problem-solvers. Although limited by a small sample and reliance on teacher accounts, the study highlights robotics as a catalyst for educational transformation and calls for future research that includes student perspectives and tracks long-term STEM outcomes.

Keywords: Transformative Learning, Robotics Education, ENA

1 Introduction and Research Questions

Robotics in STEM education fosters problem-solving, cooperation, and communication by engaging students in authentic collaborative tasks, while also supporting persistence, resilience, and a growth mindset [1]. Research shows it enhances computational thinking, motivation, and problem-solving, and shapes how both students and teachers view technology and themselves as engineers [2]. For teachers, robotics can be transformative, as challenges in simplifying concepts, managing hands-on activities, and guiding problem-solving serve as disorienting dilemmas that prompt reflection and encourage learner-centered practices [3]. This process helps educators shift toward roles as mentors and facilitators, while students strengthen reasoning, collaboration, and mathematical skills through reflection and peer interaction [4].

This pilot study will try to answer the following research questions: (1) What are common and different transformative learning pathways experienced by teachers during robotics instruction? And (2) in what ways does teaching robotics prompt critical self-reflection and identity reformation among teachers?

2 Theoretical Framework

2.1 Transformative Learning Theory and Robotics Teaching

Transformative Learning Theory, developed by Mezirow [3], explains how individuals change their perspectives through critical reflection triggered by challenging experiences. This process includes recognizing biases, engaging in dialogue, exploring new roles, and building confidence, often leading to deeper self-understanding [8]. It is shaped by social context, past experiences, and personal agency, emphasizing both emotional and intellectual aspects of learning [4]. In robotics education, it clarifies how disorienting dilemmas push teachers and students to question assumptions and adopt more inclusive frames of reference [3, 4]. Robotics education itself integrates hands-on, interdisciplinary, and technology-based learning to develop technical, cognitive, and collaborative skills, preparing students for STEM opportunities. Grounded in constructivist and constructionist theories, it positions robotics as both a tool and a learning environment, fostering creativity, problem-solving, and computational thinking. It also shifts teachers' roles toward facilitators, informs curriculum design, promotes equity and student agency, and highlights how technology-rich contexts can drive educational transformation [5].

3 Methodology

Epistemic Network Analysis (ENA) is a quantitative method for modeling and visualizing connections in discourse, making it useful for uncovering patterns of thinking in interview data [6, 7]. It requires transcription, systematic coding, and segmentation of data, after which ENA generates co-occurrence networks that show how concepts cluster and relate [8]. This approach preserves the richness of qualitative interviews while enabling systematic comparisons of reasoning patterns across participants. Prior studies [9], have shown how ENA can reveal evolving cognitive structures in narratives. In this study, ENA was applied to semi-structured interviews with robotics instructors to analyze how they connected emotional, cognitive, and pedagogical aspects of teaching. Because interviews include reflective accounts, codes such as “perspective change” or “identity shift” appeared prominently as teachers described their experiences.

1. **Table 1.** Operationalizing Constructs for ENA.

Theoretical Construct	Definition	Purpose in Analysis
Critical Reflection	Questioning one’s assumptions, values, and teaching beliefs when faced with new or challenging experiences.	Identifies moments where teachers re-evaluate their pedagogy and consider alternative approaches.

Disorienting Dilemma	A triggering event causing discomfort and challenging existing beliefs.	Marks the catalyst moment for transformation in teaching perspective.
Emotional Upset	Emotional reactions (e.g., frustration, fear, excitement) related to dilemmas or reflection.	Helps determine how emotions impact the teacher's willingness or resistance to change.
Perspective Change	The transformation outcome where teachers adopt more inclusive or reflective views of teaching and learning.	Indicates successful pedagogical growth and change in teacher identity.

Table 1 highlights four constructs: critical reflection, disorienting dilemmas, emotional upset, and perspective change. these constructs were coded in teacher interviews and analyzed with ENA to reveal patterns in how educators experience and connect different stages of pedagogical transformation.

4 Results

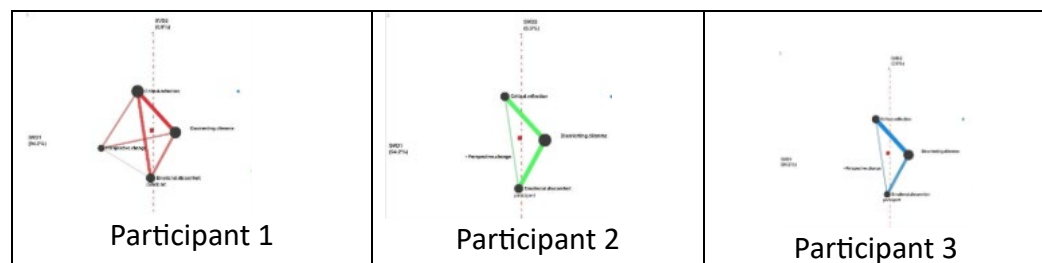


Fig. 1. Participants' networks

Figure 1 shows how using ENA of interviews with three robotics teachers, the study found that robotics instruction fosters meaningful transformative learning experiences. Teachers described overcoming personal barriers, improving communication, gaining confidence in facilitative teaching, and recognizing the value of mistakes for growth. Their transformative learning pathways shared a common sequence of challenge, reflection, and growth, but varied in focus: some emphasized overcoming fear of teaching, others on adapting strategies for different learners, and others on deepening subject knowledge. Overall, teaching robotics prompted teachers to critically examine their assumptions, shift from traditional roles toward more student-centered approaches, and redefine themselves as facilitators, mentors, and co-learners.

5 Discussion

The findings from this study demonstrate that robotics teaching is a powerful mechanism for promoting transformative learning in teachers. The Epistemic Network Analysis (ENA) models revealed significant interconnections among emotional, cognitive, and reflective constructs. Teachers described experiencing disorienting moments when students engaged with robotics in unexpected ways or when technical difficulties disrupted their lesson plans. These challenges encouraged deep reflection on their instructional beliefs and prompted many to revise their teaching approaches.

The results also suggest that robotics instruction supports meaningful changes in how educators perceive their professional roles. Teachers reported moving from traditional content delivery to more facilitative, student-centered methods. This shift was not the result of isolated incidents but rather the outcome of an iterative learning process involving emotional discomfort, reflection, and dialogue. These findings support Mezirow's transformative learning framework and highlight the importance of structured, experiential learning environments in promoting lasting pedagogical change.

6 Conclusion, Limitations and Future Research:

This study shows that robotics education extends beyond technical skills, fostering meaningful learning by encouraging critical reflection, identity growth, and professional transformation for teachers. However, its findings are limited by a small sample and reliance on teacher interviews. Future research should involve larger, more diverse groups, include student perspectives, and combine methods to better capture emotional and contextual factors. Long-term studies are also needed to understand how robotics shapes student trajectories, equity, and transformative learning in varied educational settings.

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Flowcharts all the way down

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Abstract. Quantitative Ethnography (QE) is a crucial Boundary Object unifying qualitative and quantitative analyses of the rich complexity of human activity. This presentation revisits the foundational logic of QE, addressing the challenge of transforming messy, information-rich observations into useful, statistically meaningful data without sacrificing context. We argue for a reconstructed framework to strengthen QE by making the process of QE more explicit: grounding etic codes in emic symbols, providing clearer mechanisms for describing and constructing models, and explicitly addressing fairness to subgroups, data, and theory. This work provides a necessary conceptual underpinning for the continued growth and development of new computational tools in the field.

The Submarine, the Witch, and the Bridge

Eric Hamilton

Pepperdine University

Abstract. CQE 2025 offers an inspiring range of new research employing quantitative ethnography (QE) methodology. QE itself can be described in many ways. At its heart, it seeks to use computations and mathematical tools to deepen and expand our interpretation of discourse – in whatever modality that discourse takes - across domains as diverse as those the conference represents. The stakes for the social sciences are profound: QE represents a quest, especially drawing on socio-cultural context, to connect what is said with what is meant.

This talk reflects on that quest through two lenses. First, it considers our multi-institutional journey using QE within the learning sciences to study Global South–Global North collaborations among adolescents engaged in joint science and mathematics projects. Our STEM goals were important and essential to securing NSF support, yet secondary to the deeper purpose of observing how young people use technology to bridge national, racial, economic, gender, and cultural divides. This work has been reported at ICQE since 2020.

The second lens relays stories associated with the title in reporting on efforts also shared at every ICQE since 2020. This work explores how QE can help us understand and address the toxic soup of polarization that we each face each day and that increasingly shapes public conversation. Together, these research reports are intended to invite reflection on how quantitative ethnography can help promote scientific and social connection, interpret, and perhaps foster healing, with the tools this community is developing.

Cartographies of Becoming: Toward a Rhizomatic and Justice-Oriented Quantitative Ethnography in the Age of Algorithmic Sovereignty (The algorithm mirage)

Erik Huesca Morales

Knowledge and digital Culture Foundation (FUNCO)

Abstract. Quantitative Ethnography (QE) has emerged as a methodological response to the fragmentation of contemporary knowledge systems, attempting to reconcile the hermeneutic sensitivity of classical ethnography with the analytic power of computation. Yet in doing so it reproduces an older fantasy: that the living flux of culture might be captured, codified, and rendered administrable. This essay re-conceives QE through a rhizomatic and justice-oriented epistemology inspired by Deleuze and Guattari's ontology of becoming. Drawing on recent debates in learning analytics, data ethics, and critical post-humanism, it develops three axes—entropy, bias, and sovereignty—as the cardinal dimensions of an ethical, rhizomatic cartography of human cognition.

The argument unfolds in three movements. First, QE is situated within the philosophical tension between the arboreal logic of hierarchy and the rhizomatic logic of multiplicity. Second, the article conceptualizes dynamic QE as a form of computational schizoanalysis capable of mapping epistemic trajectories across time through measures of velocity, acceleration, and entropy. Third, it warns that such power to model becoming risks collapsing into algorithmic governance, wherein the same tools that reveal difference are used to normalize it.

In response, a justice-oriented QE is proposed—one that embeds data sovereignty, the right to opacity, and the right to “weirdness” as methodological obligations. The essay closes by reframing the ethnographer not as analyst or engineer but as gardener of cognitive ecosystems, tasked with sustaining the conditions for unforeseeable growth. QE, at its best, becomes a science of liberation rather than control: a practice of mapping without capture, of measuring without colonizing, and of thinking with machines without becoming their instrument.