



Exploring Language Ideologies: Integrating Digital and Computational Literacies in Bilingual Teacher Education

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Abstract

This research takes place in a graduate online course, part of a teacher education program leading to bilingual certification in the United States. As teacher educators, the authors noticed that bilingual teachers are seldom given the time to deeply reflect on themselves and how their identities and lived experiences may affect their instructional pedagogy for linguistically diverse students. To provide students with the digital space to rethink their design choices before moving to instructional practice, the authors intentionally used collaborative methodology to guide course design to 1) weave content knowledge with computational and digital literacies and 2) explore the intersections of identity, bilingual education, and linguistic ideologies to guide and inform students' curricular design processes in culturally responsive-sustaining ways.

This work showcases the authors' design processes and how they integrate digital and computational literacies [22] in bilingual education through critical lenses such as translanguaging and raciolinguistic ideologies [8,16] and culturally responsive and sustaining pedagogies [1,10]. The authors argue that collaborative intentional design offers a moment of critical praxis, where students have opportunities to explore emerging conceptualizations about language and design, which can lead to mindful instructional and pedagogical practices in P-12 bilingual settings. The authors also posit that digital literacies have to be purposefully integrated in curriculum design to foster a critical computational literacy [11] through which students can question and identify oppressive ideologies to create new educational possibilities and stances that adequately support linguistically diverse students.

Keywords: *bilingual education, collaboration, design, language ideologies, computational and digital literacies*

1. Introduction

Effective curriculum design plays a crucial role in creating inclusive and meaningful learning environments for linguistically diverse learners. Acknowledging the limited opportunities for educators who teach in bilingual settings to reflect on their identities and experiences and how that may shape their instructional pedagogy, the authors implemented a collaborative methodology to guide the design of a bilingual education course and create intentional opportunities for reflection.

This course is part of a larger institutional initiative, Computing Integrated Teacher Education at the City University of New York (CUNY CITE), which aims to integrate computational and digital literacies into how teacher candidates and teachers are prepared across teacher education programs [3]. The purpose of this initiative is to prepare future teachers and teachers in the field to critically think about the ways in which technology impacts education, as well as to learn and teach about computational and digital literacies so that they are best equipped in the field. Thus, this paper showcases how the authors used course content (bilingual education) to leverage and introduce new content (computational and digital literacies) through a collaborative model. While asserting the necessity of purposefully integrating technology and digital and computational literacies into teacher education [20, 22], this work also sheds light on the challenges of such endeavors.

Ultimately, the paper highlights the co-designing approaches that provided opportunities for bilingual teacher education students to critically examine the intersections of their own linguistic identities and bilingual education as they learned about and engaged with digital and computational literacies. Key to this work, this paper also showcases the authors' methodologies on collaboration and the variables necessary for collaborative course design, a gap in higher education [17,13].

2. Pedagogical Positionality

2.1 Context and Content



This paper focuses on a foundational bilingual graduate online course, part of a teacher education program leading to bilingual certification, that prepares students to teach in bilingual/dual language settings in the Southern New York area. In addition to exploring the history of bilingual education [6, 7], dual language allocation models [15], translanguaging in school settings [5, 8], and the ways in which culturally responsive and sustaining (CR-S) educational frameworks [14] can be situated in bilingual education, students develop resources or curricular material intended to empower and support bilingual students' strengths and needs. As part of the CUNY-CITE initiative, students in this course were also introduced to new content material: computational and digital literacies (CDLs). As such, the goals of the course are two-fold: to build up knowledge and application of bilingual education frameworks and to encourage students' understanding of CDLs in relation to their pedagogical practice.

To figure out how best to integrate CDLs into the course's content, prior to co-designing the course, the authors participated in professional development for faculty offered by CITE. The authors leveraged their expertise and newfound knowledge of CDLs to co-create a teaching artifact or project students in bilingual teacher education settings could engage with to further their CDL understanding. Although the teacher educators co-constructed the artifact over the summer, finding ways to integrate it more meaningfully into the course's content and class' context proved to be a complex task, requiring an ongoing semester-long collaborative methodological effort to ensure alignment with evolving student needs and instructional goals.

2.2 Course Design and Collaboration

We argue that collaborative design offers a moment of critical praxis, as it makes visible pedagogical stances, creates opportunities for multiple perspectives for sensemaking, and counters individualized design epistemologies. For many of us, collaboration is key to our ways of knowing [4, 12] and thus, as a methodology, collaborative stances create opportunities in curricular design to mirror collaborative knowledge production. In the case of this work, collaborative course design by teacher educators led to the creation of instructional opportunities where students explored course content in collaborative ways as well.

Weiss et al. [21] argue that to achieve a genuine comprehension of effective collaboration among teacher educators in higher education, greater emphasis should be placed on the collective actions of faculty or the dynamics inherent in their collaborative efforts. Without a thorough grasp of what takes place during faculty collaboration, designing curricula that sufficiently and adequately prepare teachers becomes challenging. Nevin et al. [13] also highlight that few empirical studies of the impact of collaboration in teacher education were published since 2000. As a result, scholars like Weiss et al. [21] continue to advocate for the consideration of various factors that contribute to the complexity of collaboration and have contributed frameworks guiding collaborative efforts among educators in higher education. Similarly, Jarvis et al. [9] provides a collection of examples and stories that focus on the day-to-day reality of teacher collaboration as it relates to implementing innovative teaching practices. To fill in this gap, this study also aims to provide insight into the collaborative process between two teacher educators (authors), shedding light on the intricacies of their collaboration and its implications for bilingual teacher preparation and course design.

Our study also aims to fill in this gap in scholarship by providing detailed insight into the collaborative process between two teacher educators, shedding light on the intricacies of their collaboration and its implications for bilingual teacher preparation and course design.

We refer to our collaboration as co-design to reference the cooperative efforts between both educators to plan, develop, and refine the content, structure, and delivery of a bilingual teacher education course. In addition to vetting resources and exchanging ideas to create engaging and effective learning experiences for students, the co-design practices involved centered our expertise, lived experiences and pedagogical stances. Both authors leveraged their shared experiences as bilingual students and teacher educators to consider the needs of their students. By placing emphasis on their lived experiences, the authors recognized a common curricular concern: students lacked structured opportunities to explore their beliefs and perceptions regarding language and language education. The collaborators co-designed specific activities to grant students the time and space needed to make sense of language ideologies (discussed in 3.1 section). The collaborative process over time (see table 1 below) also led the co-designers to address the ongoing challenges involved in weaving content knowledge with computational and digital literacies in real time, and to thoughtfully develop innovative strategies for integrating these elements seamlessly into students' coursework (discussed in the 3.2 section)



Table 1. Course Design and Collaboration Timeline

Data collection, co-designing		
Timeframe	Activity	Purpose
Summer 2023 Professional Development (through CUNY-CITE)	Both authors participated in summer PDs about computation and digital literacies.	Authors used their respective PD understandings to build an artifact for the course (an assignment) that intertwined bilingual education and computational and digital literacies.
August 2023 — December 2023	Weekly co-designing sessions (Fall 2023 course)	Authors used these sessions to reflect on students' engagement in the course, plan future course sessions, and create/modify materials.
February 2024 — ongoing	Weekly co-designing sessions (Spring 2023 course and research dissemination)	Authors use these co-designing sessions to modify the materials for the course explored in this paper for another course. In addition, these sessions serve as sensemaking opportunities for research dissemination.

3. Curricular Decisions

3.1 Course Content, Assignments, and Activities

Utilizing the course content (bilingual education), students were provided with various entry points to understand language education and language ideologies through course readings, class activities, and assignments. Table 2 below describes key assignments in this course. In addition to the content of the course, students were introduced to computational and digital literacies (CDLs) through direct instruction via lectures, collaborative digital activities, and an unplugged activity (paper engineering pop-ups). All of the course readings, assignments, and activities were purposefully chosen and models were created (Figure 1) during the authors' co-designing sessions to give students the opportunity to engage with the various topics in the classroom in digital and authentic ways.

Table 2. Key Assignments

Key Assignments in this course	
Name	Description
Bilingual Education Timeline	In groups, students research specific eras (1920s, 1940s, 1960s, etc.) and map out policy and major historical events that contributed to the way Bilingual Education in the U.S. is today.
Paper Engineering Pop-ups	Students engage in computational literacies through this unplugged activity. Students use paper engineering to create a prototype and an iteration of a pop-up. In their iteration, students add external (social perceptions)/internal (personal views) pertaining to language.
Multimedia Portfolio	This final assignment asks students to use course content and incorporate it to their pedagogical practices. The work is created and presented in different ways, adding a multimedia component to this assignment.
Journals	Ongoing throughout the semester

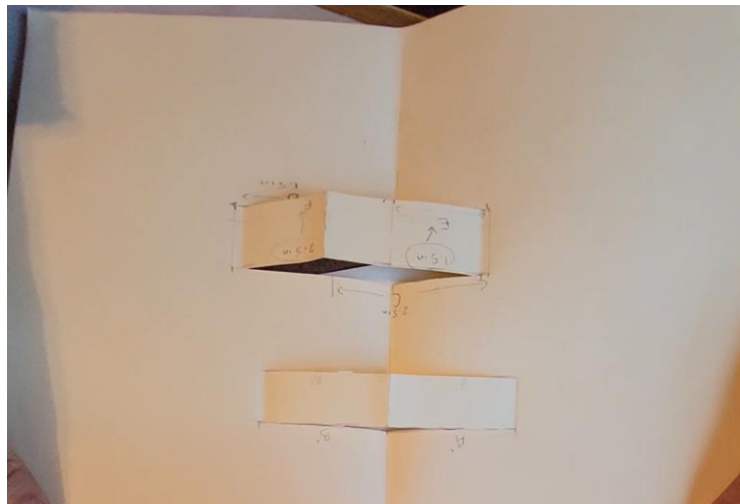


Figure 1. Model of a parallel and unparallel fold

3.2 Integrating Computational and Digital Literacies (CDLs)

As teacher educators, we recognize that in the digital age in which we learn and teach, teacher candidates (pre-service education students) and teachers in the field, must be equipped to teach with technology. However, being able to simply use technology is not enough. Teachers and teacher candidates must be adequately prepared to understand and critique the underlying facets of technology, as well as learn and teach computational and digital literacies. CUNY CITE defines digital literacies as the use of digital tools (i.e. for navigating information, creating content, communication), and computational literacies as getting “under the hood” of digital tools and processes (i.e., computational thinking, data practices, design thinking). While in many spaces CDLs are isolated in computer science or ed tech courses, Yadav et al. [22] argue for the interdisciplinary integration of computational thinking in teacher education programs. Similarly, we decided to integrate CDLs into this course so that students in bilingual education could engage with CDLs through different entry points (see Table 2).

While there has been work that connects the ways in which bilingual students (K-12) use their full language repertoire to engage in computational literacies [18, 19], the purpose of this work is to focus on bilingual educators that teach this population. Educators should understand how to use digital tools, but in order to teach students about emerging technologies and the ways in which to understand, create, and critically engage in computational and digital literacies [11], teachers in the field as well as those being prepared to become teachers, must also engage in CDLs through design, exploration, and iteration, something that may mirror their work in the classroom.

4. Addressing Challenges

Weaving in computational and digital literacies with the course content was initially difficult because we didn't know students' comfort levels and previous knowledge with such. When designing the course, we considered that people who do not have a background in computer science or programming might feel intimidated by the terminology associated with computational literacies (e.g. experimentation, debugging, iteration). As a result, we decided to introduce key terms, such as the aforementioned, in relation to design making processes that teachers, like our students, already engage in daily when planning for instruction. Using computational literacy terminology to describe pedagogical design processes proved helpful to alleviate the hesitation some of our students felt with the vocabulary and strengthened their understanding. For example, when introducing experimentation, iteration and debugging, we made explicit comparisons to the way teachers often try new things in the classroom (experimentation), acknowledging that often teachers address what went well and what could go better (debugging) afterwards to make future pedagogical decisions, and emphasized that at times this process takes on various tries (iterations). Using computational literacy terminology to explain the design processes teachers engage in also helped us bridge CDLs with the course's content goals which aimed to address issues of linguistic discrimination. To counteract initial confusion about the concept of discriminatory social design, we introduced Ruha Benjamin's work [2], which explores the



intersections of race, technology, and society, examining how innovations can reinforce or challenge social inequalities. Specifically, we focused on her use of social algorithms—sequences of instructions crafted by programmers that encode and perpetuate social biases and inequalities, influencing societal behavior and outcomes. By incorporating computational literacy terminology into our teaching alongside Ruha Benjamin’s ideas on discriminatory design, we broadened students’ understanding of design processes, enabling a more comprehensive perspective that framed their critical thinking of language ideologies and how these can shape equitable or discriminatory pedagogical design.

To deepen their understanding, we guided students in creating a pop-up design to represent their language ideologies. This proved challenging as we were uncertain how to elicit these ideologies effectively for integration. To address our concerns, we collaboratively created a graphic organizer (see Figure 2) guided by two prompting questions aimed at eliciting students’ ideas about external and internal language ideologies. After co-designing the graphic organizer, we filled it out together to test its effectiveness. This process helped us refine the prompting questions, clarified what we would ask students to draw from when completing the organizer, and prepared us to address any student confusions during their engagement with it. Testing the activity together revealed that students could draw not only from the language theories explored in the course, but also from their own personal experiences with language. Our collaborative exercise served as a final model to refine the instructions. These instructions asked students to draw from their lived experiences with language and the course resources to answer the guiding questions and generate significant quotes for their pop-ups. Designing the graphic organizer, testing it together, and using it as a model led us to encourage students to work on it collaboratively with a partner. Collaboration allowed students to exchange ideas and better distinguish between internal and external language beliefs. Although integrating CDLs into our course content initially posed challenges, given varying student familiarity with computational terminology, our ongoing collaboration helped us identify design moves to scaffold and support our students’ understandings and connections.

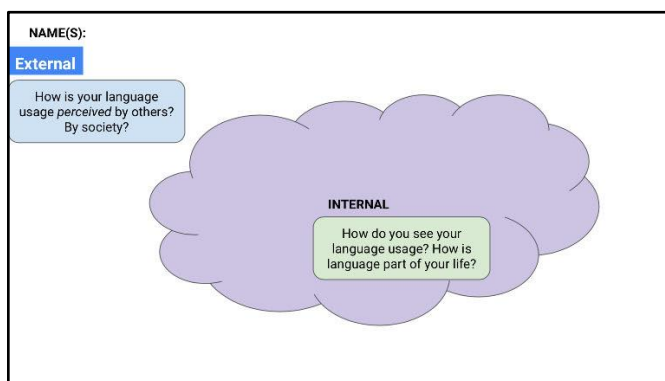


Figure 2. Language Ideologies Graphic Organizer

5. Conclusion

This paper showcases how the authors co-designed a bilingual education course aiming to intertwine content knowledge (bilingual education) with digital and computational literacies. By engaging in collaboration, leveraging critical lenses such as translanguaging [8] and raciolinguistic ideologies [16], we provided students with opportunities to explore their own language ideologies and implications for instructional design. Through our collaborative efforts we identified opportunities to scaffold students’ progress and fostered a deeper understanding of design processes and language ideologies. Our approach not only addresses the challenges of integrating computational literacy into bilingual education, but also highlights the importance of collaborative design in teacher education. Moving forward, our work underscores the significance of purposeful integration of technology and critical computational literacy in fostering equitable and transformative pedagogical practices in bilingual settings through a collaborative methodology.



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