Exploring Identity through Computing Integration in a Spanish Language & Literature Class

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Abstract—With a shift towards culturally responsive computing pedagogy, some researchers have turned to integrating computing education with other subjects for its capacity to engage students' interests and identities. However, prior work shows that language-learning integration is rare. Thus, in a post-secondary Spanish course, the first author taught a programming workshop using Twine to analyze Afro-Cuban poetry. A review of instructor notes and student projects revealed that students used Twine to analyze poetry while integrating their identities into their projects. Furthermore, it shows how programming can be introduced to novice users in a manner relevant to their own educational expertise.

Keywords—computing education integration, culturally responsive pedagogy, language learning

I. Introduction

With a shift towards culturally responsive computing pedagogy, some researchers and practitioners have turned to computer science integration into other subjects as one way to introduce computing to students [1]–[13]. Although these initiatives give insight into what computing integration looks like in STEM and the arts, very little has considered the intersection between language and computer science. Some research aims to make space for all the languages multilingual students speak at home. For example, Vogul et al. and Ascenzi-Moreno et al. examine translanguaging in computing for multilingual students learning computer science [14], [15]. Similarly, Jacob et al. investigated how to integrate computational thinking in English language arts classes for multilingual students [16]. Moreover, Burke & Kafai studied how students use their knowledge of the writing process to create projects in Scratch [17].

Of the research that has examined language and computer science, few have looked at language learning in particular. For this paper, we define language learning as learning a non-native language or one that is different from those spoken at home. Language learning has many possible interactions with computer science. For some students, language may be a form of self-expression and creative computing can give students an avenue for creative expression in a new language. Creative coding can be a great way to bring their identity into the classroom while learning a new skill and language. There are also many parallels between natural languages and programming languages, such as concepts of syntax, semantics, and grammar.

II. Context

The first author wanted to explore what it would look like to teach culturally responsive computing in a Spanish language and literature class. So they designed and taught a small and brief programming workshop in a post-secondary upper-level Spanish language and literature course. The workshop was taught at a liberal arts[1] college in New York (the first author will be referred to as the "instructor" henceforth when discussing the workshop). The class was the highest level of Spanish taught in the spring semester, and the group consisted of both heritage speakers — for which Spanish is the language spoken at home — and non-heritage speakers.

A. Students

The workshop had a total of 5 students — 3 college students, a graduate language tutor, and the professor of the class. All students self-reported demographic data in an optional free-response portion of the post-workshop survey (see Table I).

B. Positionality

As a marginalized student in computing, the first author's research focuses on equity and justice, particularly in the classroom. Because they often felt left out in computing spaces, they aimed to make this workshop relevant to the students and their class material. They chose to use Twine because it has been a helpful and creative tool for them to learn computer science. The second author has taught computer science at a liberal arts college for over a decade. Their teaching, and outlook toward computing widely adopt an interdisciplinary lens. Moreover, broadening access to college-level computer science courses, specifically for historically excluded groups, has been a priority. The third author served a strictly advisory role in the work, helping the first author write, analyze, and report on their experiences. She approached the work with interest in highlighting the potential of unexplored integrations between computer science and other disciplines.

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[1]a university that typically emphasizes undergraduate study in the humanities and sciences

TABLE I
STUDENTS SELF-REPORTED DEMOGRAPHICS THROUGH OPTIONAL SECTION IN THE POST-WORKSHOP SURVEY.

Participant	Heritage Speaker	Race/Ethnicity	Gender Identity	Prior Experience in CS	Prior Experience using Twine
Student 1: Student	Yes	Dominican	Female	No	Yes
Student 2: Student	No	White	Male	No	No
Student 3: Student	No	White	Female	No	Yes
Student 4: Tutor	No		Cis-Male	Yes	No
Student 5: Professor	No	Anglo-European	Cis-Female	No	No

III. WORKSHOP

The 80-minute workshop, designed and taught by the first author, followed the structure of the Twine workshop created by Tirto et al. which taught students the fundamentals of Twine [18]. Unlike Tirto's workshop which was taught in English, this workshop was conducted entirely in Spanish, using the Twine interface in Spanish.

Twine is a desktop and web-based application, similar to Unfold Studio, used to create interactive hypertext stories. Creators link passages or parts of their story together resulting in interactive web pages which give users the choice of what part they want to go to next. Creators can place multiple links in one passage resulting in a choose-your-own-adventure user experience. These links appear as hyperlinks and often dictate what narrative the user experiences. Twine is free and thus has been used in art communities as an inexpensive way to create interactive stories and games [19], [20]. It is also learnable and expressive, as no prior programming experience is necessary to easily and quickly create a story [20]. We chose Twine because of its versatility and avenues for creative expression.

To plan the workshop, the instructor met with the class' professor to discuss what Twine was and what learning objectives the workshop could meet. As a student in the class themself, the instructor was familiar with the course material. Given the unwelcoming environment for Black students in Spanish language learning classrooms [21], [22], coupled with the instructor's positionality as a Black person, the instructor decided to focus on the unit exploring Nicolás Guillén, an Afro-Cuban poet. Guillén's poetry critiques pre-revolutionary Cuba as well as discusses Afro-Cuban identity. His poem "El apellido" [23] details the generational loss of identity that he and his ancestors faced due to the trans-Atlantic slave trade (see [24] for a translation of the poem). Through the over 100-line poem, Guillén laments and mourns the fact that he doesn't know his African name, providing plausible last names presented as neologisms, or names/words he made up himself. "El apellido" is rich with metaphors and African and Cuban cultural references. The first author believed that the creative self-expression in "El apellido" allowed avenues for students to see themselves in the poem.

The workshop began by teaching students about Twine's *passages* and *links*. Passages function as paragraphs or different parts of their story. They then learned how to link their passages together by encompassing the word or phrase they want to appear as a hyperlink in square brackets ([]). To run their code, students clicked the play button icon and saw how their code generated a web page with link(s) they could click and play through their story. After demonstrating passages and links, students were given time to work on their projects. When they encountered errors or had questions their instructor was available for help. For example, students quickly learned about case sensitivity — that a passage called "Begin" was different from a passage titled "begin".

After about 20 minutes of work time, the class regrouped to learn about dynamic link creation. They learned the differences between the *static* link that users click on to navigate through the story, and *cycling links, random links, and live links*. The *cycling link*, is a link that tricks the user. It appears on the screen in the traditional blue link mark-up, but when it's clicked on, instead of taking the user to another passage, it reveals another word or phrase. *Random links* create a unique experience for different users, presenting one option from a list. Creators may choose to use random links to change the adjective, noun, or verb in key sentences in their story, thus changing the meaning of the given passage or the whole plot. *Random links* do not appear as hyperlinks, but rather as plain text. Lastly, *live links* are timed links that reveal words or phrases at a set interval. Creators can change the amount of time a word or phrase is displayed in the code. *Live links* are a dynamic way to have fun or show users more information by just changing a few words. Adding dynamic links shows students how to create a user experience, a common goal of computer programming that differs from writing a traditional essay for class. When creating their Twine it was important to show students ways they could not only write for themselves but also think of the experience they wanted their users to have.

In addition to learning how to program in Twine, students learned key programming skills. They were taught semantic rules like how names of passages must be unique and that spelling matters. They learned stylistic guidelines like creating descriptive passage identifiers to support comprehension and navigation. Additionally, they learned how to change text and background color in CSS, and add images and videos in HTML. Because the workshop was taught in Spanish, students learned common computing terminology like run (*reproducir*), debug (*depurar*), and square bracket (*corchetes*).

Students were tasked to create an interactive story or game using Twine in response to "El apellido." This could range

from writing their own poem mimicking Guillén's writing style, reflecting on their own identity, or representing a short analytical essay in Twine.

IV. REFLECTION

After the workshop, the instructor and the second author met to review student projects, instructor observations and notes, and the post-workshop survey and discussion. The authors came to an agreement that the students both analyzed the poem using Twine while also creating projects that explored their identities. The review also revealed the experience of a skeptical student and showed how the students developed camaraderie during the workshop. This section explores all these themes in detail pointing to specific examples from student work, post-workshop survey and discussion, and instructor observations and notes. We put English translations of quotes in parenthesis.[2]

A. Poetic Analysis

Student projects showed a deep understanding of the poem. For example, Student 1 used Guillén's language, however, during the analysis, we had to go back to the poem to distinguish between the student's language and Guillén's. In creating a continuation of "El apellido," Student 1 showed their creative faculties and understanding of the poem as their writing flowed well with Guillén's. For example, they used the line in "El apellido," "*tambores en mis ojos*?" (drums in my eyes) to create their own passage which continued the rhythmic theme in the poem saying

> "*tambores que me hacen bailar, que me llenan de alegria y profundos deseos de triunfar. … tambores que interrunpen mi descansar y le dan animo a mi expectador*" (drums that make me dance, that fill me with joy and deep desire to succeed. … drums that interrupt my rest and encourage my peers).

This creative addition shows a deep understanding of the poetic themes of rhythm, personification, and dance.

Student 5 used the phrase "*¿No veis estos tambores en mis ojos?*" (You don't see these drums in my eyes?), to analyze Guillén's use of a self-reflective question. In their project, they wrote:

> "*Con esta pregunta, Guillen crea una imagen tan fuerte de su identidad profundamente africana. La imagen es corporal–los ojos–y tambien sensorioal (casi escuchamos los tambores). Que imagen puedes crear tu para senalar tus origenes.*" (With this question, Guillen creates such a strong image of his deeply African identity. The image is bodily–the eyes–and also sensory (we almost hear the drums). What image can you create to point out your origins.)

This shows deep close reading and understanding of the poem, as the student is able to note the use of imagery and rhythm. The computing integration served a vehicle for such a creative project.
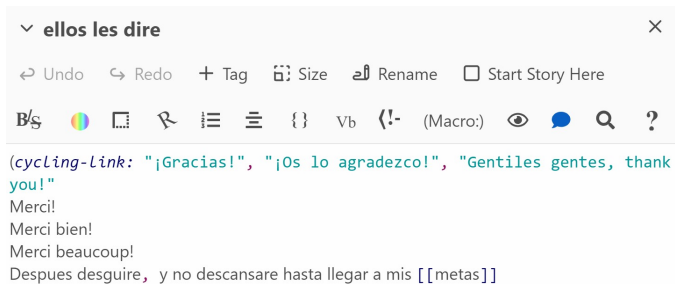
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[2]Quotes in Spanish were translated by the first author.

Fig. 1. Student 1's use of cycling-link, one of the dynamic links students learned during the workshop.

B. Exploration of one's own identity

Many students created projects that explicitly mentioned their own identities. Student 5 created a narrative that asked users what their last name is and categorized them by origin, "*ingles, hispano, africano, no se*" (English, Hispanic, African, I don't know). When users choose "*ingles*," they arrive at a passage that details Student 5's last name. Here, they are aligning themselves as someone who has an English last name. Through their project, Student 5 created an interactive experience that not only included their positionality, but also that of the user, which may allow users to feel represented in their project.

Student 1's project explored their relationship with their grandfather, quoting Guillén's mention of his grandfather, "*un abuelo nocturno*" [a nocturnal grandfather], as a link to a passage saying:

> "*Quiero trabajar tan duro como el. El me dio a ver mi barrio, el cual tambien le debo mi crianza, a ellos les dire sin sarcasmo ni timidez:*" (I want to work as hard as him. He gave me to see my neighborhood, which I also owe my upbringing to, I will tell him without sarcasm or shyness:)

Student 1 highlighted their grandfather's hard work, commenting on how much they admired and appreciated them. They finally end the path by thanking their grandfather,

> "*(cycling-link: ¡Gracias!, ¡Os lo agradezco!, Gentiles gentes, thank you! Merci! Merci bien! Merci beaucoup! Despues desguire, y no descansare hasta llegar a mis metas.*"

Here they use the verses where Guillén sarcastically says "thank you" in Spanish, English, and French. Unlike Guillén, Student 1 is not being sarcastic, as they mention in the previous passage ("*sin sarcasm*"). Their ability to emulate Guillén's writing shows their understanding of the poem. Furthermore, Student 1 chose to use a *cycling link* to display the "thank yous," therefore showing not only their understanding of the poem, but also how the poem and the code can work in tandem (See Figure 1).

Using Twine to analyze "El apellido" allowed Student 3 to navigate their own positionality in relation to the poem while also curating an experience for their users. Student 3 remarked,

"I think that the twine activity help[ed] me connect more with the anxiety that surrounds questions about identity. El apellido reflects a bit of frustration or anxiety about the loss of one half of Guillen's identity."

Student 3 emulated this anxiety by creating a Twine which examined the different parts of their compartmentalized identity. They expressed that *"[they] feel a bit like no one in any of the contexts really understands me and so each feel like it's missing something."*, and thus wanted to highlight that experience in their project.

C. The Skeptic

Student 2 was very skeptical about using Twine to analyze literature. During the workshop, they were observed talking to their peers instead of working on their own projects. With the title of "Demo," their Twine only consisted of two passages; however, they did integrate color into the last passage indicating that they learned how to change text color using the Twine programming language Harlow. In the post-workshop discussion, Student 2 was very hesitant to give feedback as they thought it would not be helpful, as though negative feedback about technology use in the classroom is not wanted. After reassuring them that their opinion was valid and wanted, they gave what they called their "*idiodic disposition*" saying, "*I ... like ... just don't like using computers ... I mean ... I've never enjoyed coding or anything like that ... I would just use the text and do something in-person.*" Student 2 is a humanities major who prefers traditional literacy, and their experience is representative of the students who may not enjoy learning digital literacies in class.

D. Class Camaraderie

A uniting factor in each student's participation was not merely their engagement in the project, but their engagement with each other. Students were observed not just asking those seated directly next to them about their projects, but physically moving around the computer lab to see the other projects. During the independent working portion of the workshop Student 1, who was seated at one end of the row of computers, walked to Student 3's computer which was located at the other end. Student 1 exclaimed, "*tienes tantos pasajes*" (you have so many passages!). They both laughed and Student 1 called the other students to the computer. Student 3 then explained their idea to the whole class—they were creating a project that explored the different parts of their identity. Introducing computing allowed students to explore a new skill which resulted in high moral.

V. DISCUSSION

The workshop revealed that students can engage with themes of identity through poetic analysis using computing. Overall they showed exemplary poetic analysis. They were able to use themes in the poem and apply their own creative twists. They looked beyond the text and showed they understood the poem's meaning in its broader context. While many

students integrated their own identities into their projects, other students created projects that engaged with literary themes. Students were all able to create passages and links in Twine, demonstrating a mastery of the basic programming aspects of Twine. Others went even further to integrate complex elements like cycling links, color, and thoughtfully curate an experience for their users.

Our work also revealed the reluctance of a skeptical student. This finding may show the limitations of computing integration, as some students may see learning computing as a threat to their field. These sentiments echo a growing sense of fear in the humanities that technology is overtaking their field [25]. Future work can focus on how to meaningfully engage students who are hesitant to learn computing by showing them ways they can use it in their field.

Our workshop revealed rich findings, however, there were some limitations. The workshop was small in size (5 students), and this work is only representative of the students and their lived experiences. Future work can explore integration into other languages and learning contexts like in elementary and secondary schools. The Spanish language was also a barrier in the workshop. For example, not all the syntax and semantics in Twine are translated into Spanish (e.g. cycling-link, size, and color). Although students used the Twine interface in Spanish, the programming language was still in English. Similarly, keyboards also proved to be a barrier. Although students were able to change their keyboard settings to Spanish, they lost the ability to use the square brackets. Thus, students had to choose between programming accuracy or ensuring their Spanish was grammatically correct. Future work in computer science integration into language learning can explore ways multilingual students can seamlessly transition between languages.

In sum, the workshop shows that integrating computing into a class that students are passionate about can present a culturally responsive avenue for them to learn computing. These findings are supported by previous work on how Twine and other interactive fiction platforms allow students to gain a different perspective on the literature being analyzed [26]. These experiences suggest that there's a vast unexplored potential for integrating computing into the language arts. As our workshop only explores one way of integrating computing into language learning classes, future teaching and research should explore the other interactions with computing and language arts.

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