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Article

The Process of Belief Change in English Language Teaching Pre-Service Teachers: A Study in Technology Integration within a Digital Humanity Course

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Abstract: While a number of studies focused on pre-service teachers' belief change in teacher education programs, the process of English Language Teaching (ELT) pre-service teachers' belief change on technology integration remains underexplored. Adopting Cabaroglu and Roberts (2000)'s framework, this study investigated the process of belief change among three ELT pre-service teachers in a digital humanity course in a teacher education program in the US. The data were collected from interviews, the "story of self" of the participants, bi-weekly reflective journals, end-of-the semester reflection papers, and lesson plans. The study revealed that student teachers' beliefs experienced different processes of change during the course, including awareness and realization, confirmation and consolidation, elaboration and polishing, addition, disagreement, and reversal. The paper provides a new understanding of the benefit of a digital humanity course with a technology integration focus in a teacher education program, which could exert a significant effect on affecting pre-service teachers' beliefs on technology integration.

Keywords: teacher education; teacher beliefs; pre-service; ELT teachers; technology integration

Pre-service Teachers' Changing Beliefs in a Digital Humanity Course: Three Cases of ELT Teachers

In the field of teacher education, teacher belief is a widely researched topic (Borg, 2003). The significance of teacher beliefs lies in the fact that teacher beliefs shape their classroom practices. Teachers' beliefs influence how teachers think about teaching, how they perceive themselves as teachers, and how they define and act in their classroom teaching practices (Mak, 2011). One feature of teacher beliefs is that they are not static and subject to change (Borg, 2003; Ulla, 2022). The role of teacher education programs on altering and shaping pre-service teacher beliefs has been well-established (Nazari & Xodabande, 2022; Ulla, 2022). For example, research has shown that pre-service teachers consolidated (Moon et al., 2022), elaborated (Yuan & Lee, 2014), and reversed (Debreli, 2016) their teacher beliefs during teacher education programs.

Moreover, as teaching beliefs could include numerous aspects, one essential aspect is technology integration in teaching, which has become more prominent since more online and hybrid teaching have been implemented in recent years. In fact, researchers and practitioners have long called for incorporating technology into language teaching (e.g., DelliCarpini, 2012; Tour, 2015) due to its efficiency in improving learners' language learning outcomes (e.g., Lee et al., 2022). Moreover, research has called for in-service (e.g., Liu & Kleinsasser, 2015) and pre-service teachers (e.g., Sun & Zou, 2022; Grau & Turula, 2019) to integrate technology into language teaching practices. Considering the efficiency of technology-integrated language teaching and its sophisticated nature, it is necessary to examine the changes of pre-service teachers' belief on technology integration during

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their training. In particular, there is a need to investigate pre-service teachers' beliefs on integrating technology in their teaching (e.g., Moon et al., 2022).

This research is led by the belief that a better understanding of pre-service teachers' complex belief change processes can shed light on how teacher education programs exert influences on technology integration beliefs, which in turn will lead to improved language teaching practices. In particular, this study was conducted with the aim of extending our understanding of the nuanced and vibrant belief change processes on technology integration among ELT pre-service teachers, which is a topic currently less explored. Adopting Cabaroglu and Roberts' (2000) framework on teacher belief change and sociocultural perspectives, this study examined the belief change processes of three pre-service ELT teachers in a digital humanity course in a teacher education program in the U.S.A.

Literature Review

The literature review is organized as follows. We start by introducing definitions of teacher beliefs and studies linking teacher education programs to teacher beliefs. The next section reviewed a few studies that examined the processes of teacher belief changes. This is followed by a section on the studies that investigated technology integration beliefs in ELT contexts. Next, we turn to factors that have contributed to the change of teacher beliefs. The literature review concludes with a theoretical and pedagogical justification of investigating teacher belief change processes longitudinally and qualitatively.

Teacher Belief

Beliefs have been defined from a range of psychological and philosophical perspectives (e.g.,Anders & Evans, 2019). Previous research has suggested that beliefs are propositions individuals consider to be true and which often have a strong evaluative and affective component and provide a basis for action (e.g., Borg, 2011). Kagan (1992) defined teacher belief as teachers' "implicit assumptions about students, learning, classroom, and the subject matter to be taught'' (p.66). Based on sociocultural theory perspective, teachers' beliefs are not pre-determined or stable, but open to change (e.g., Yuan & Lee, 2014). Teacher beliefs are generally considered to have a powerful influence on teachers' actions (e.g., Anderson et al., 2022; Borg, 2011; Tang et al., 2012).

Previous research in the field of teacher education has shown the effectiveness of teacher training programs on the change of teacher beliefs (e.g., Borg, 2011; Debreli, 2016; Qiu et al., 2021; Pellikka et al., 2022). For example, Borg (2011) investigated the influence of an intensive eight-week in-service teacher education program in the UK on the beliefs of six English language teachers. The data were collected through semi-structured interviews, coursework, and tutor feedback. The study found that the teacher training program has a considerable impact on the teachers' beliefs. Three teachers became more aware of their beliefs and were able to articulate them. Similarly, adopting an experimental and control group design, Qiu et al. (2021) investigated the belief change among 142 ELT pre-service teachers in China. The experimental group participated in a three-month teaching practicum while the control group did not. The results showed that there were significant changes in three aspects of teacher beliefs among experimental group participants: student management, teaching and evaluation, and student learning. However, qualitative explorations on belief changes among preservice teachers in the current United States with a focus on a particular course work is rare.

Belief Change Processes

While studying the impact of teacher education programs on the change of teacher beliefs, researchers have shifted their attention from the "content" to the "process" of teachers' belief change (Yuan & Lee, 2014). Previous research has summarized a list of belief change processes. For example, Cabaroglu and Roberts's (2000) framework introduced a complex process of pre-service teachers' belief change. The belief change category introduced by Cabaroglu & Roberts included awareness,

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realization, consolidation/confirmation, elaboration/polishing, addition, re-ordering, re-labeling, linking up, disagreement, reversal, pseudo change, and no change (Please see Table 1 for the detailed definition of each category). A number of studies have adopted this framework to investigate the belief change processes (e.g., Debreli, 2016; Yuan & Lee, 2014). For instance, Yuan and Lee (2014) reported different processes of teacher belief changes among a group of English as a foreign language (EFL) teachers in China in a teaching practicum. The study found that student teachers experienced different types of belief changes, including confirmation (pre-service teachers' prior beliefs were more established through learning new information), realization (pre-service teachers became more fully aware of a new idea), disagreement (student teachers abandon an old belief and embrace a new belief), integration (a complicated process of refining and reorganizing the prior and new beliefs into a comprehensive system), and modification (student teachers modified their prior beliefs). Similarly, Pre-service teachers in Moon et al. (2022) solidified their belief in technology integration through hands-on practice and analysis. It seemed that pre-service teachers were more confident that technology could benefit content learning and impact pedagogy. Moon and colleagues call for future research to attend to preservice teachers' processes of belief changes.

Teacher Beliefs in Technology Integration

With emerging uses of educational technologies and the outbreak of Covid-19, investigating pre-service teachers' beliefs in technology integration has both theoretical and practical significance (Moon et al., 2022). Technology integration belief was defined as a decision-level rationale that desires better solutions and practices on technology integration (Graham et al., 2012). Educational technology research has found that these beliefs are nested in a dynamic and concentric circle-like system and assumed to be highly intertwined (Ertmer &Ottenbreit-Leftwich, 2010; Vongkulluksn et al., 2020). Considering the sophisticated nature of technology integration in language teaching, it is necessary to implement purposeful training for pre-service teachers. In particular, there is a need to investigate pre-service teachers' beliefs on integrating technology in their teaching (e.g., Moon et al., 2022). Teachers' beliefs profoundly influence pre-service teachers' future technology integration practice.

Methodologically, teacher beliefs on technology integration were largely being studied via quantitative designs in aspects such as competence beliefs, value beliefs, and pedagogical beliefs (Cheng & Xie, 2018; Cheng et al., 2022; Heath & Segal, 2021; Tondeur et al., 2017) and their relations with pedagogical and content knowledge (e.g., Harris et al., 2017; Liu & Kleinsasser., 2015; Moon et al., 2022; Nazari et al., 2019; Rahman & Harun, 2018; Tai, 2015). For example, after comparing pre- and post-Technological Pedagogical Content Knowledge (TPACK) survey results, Moon and colleagues (2022) concluded that pre-service teachers' technology-integration beliefs (i.e., technological content knowledge, technological pedagogical knowledge, pedagogical content knowledge, and technological, pedagogical, and content knowledge) have increased through design practices. There is a gap in teacher belief-related technology integration research for an in-depth and nuanced understanding of how teachers' beliefs progressed and changed during their digital and technology integration training.

Factors Influencing the Change of Beliefs

Research explored the factors that can influence preservice teachers' change of beliefs (Gebhard, 2009; Qiu et al., 2021; Yuan & Lee, 2014). Various K-12 preservice teacher training has found sociocultural factors (Vygotsky, 1978) influenced various disciplinary preservice teachers. For example, Wang (2016) noted that although previous learning experience gives contribution to changing Chinese as a foreign language teachers' beliefs , the input on learning with others during teaching practicum was regarded as the most accurate and reliable factor influencing their change of beliefs. Additionally, Pellikka and colleagues (2022) found that possible changes in elementary school teachers' beliefs were related to their cognitive and affective dimensions and occurred in different stages of teacher education. Similarly, Moon and colleagues (2022) found that science teachers can change beliefs if they were given *practices* in designing lessons. Qiu et al. (2021) found that different factors have contributed to the change of a group of pre-service EFL teachers' beliefs, including their

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original beliefs and experiences, practicum supervisor, peers, and the school ethos of the practicum schools. Yuan and Lee (2014) discussed sociocultural factors that influenced the change of beliefs, which included the community of English teachers in teaching practicum schools, mentors, and other school activities such as teaching reform, book club, and classroom observations. Prior technology using experience was also identified as a factor that would influence pre-service teachers' beliefs on technology integration (Park & Son, 2022). Yet, little is known on the roles specific sociocultural factors in contextualized course work of technology integration played in preservice teachers' belief change.

The current study identified a few gaps. First, there is a need to conduct more research on teacher belief changes on technology integration among ELT pre-service teachers. In particular, it is unclear how a digital humanity course could impact pre-service teachers' beliefs on technology integration longitudinally. Second, the current studies on teacher beliefs have been mainly investigated through quantitative approaches, resulting in a comparison of pre-and post- teacher belief changes. As pointed out by Yuan and Lee (2014), more studies on the "process" of teacher belief changes could be conducted so as to capture the nuance and complexity of teacher belief changes in a teacher education course. Third, without clarifying how the changes of teacher beliefs and technology integration are contextualized in their own experiences, researchers and stakeholders could be misled to target a belief factor that is not effective for intervention. In summary, the current state of the evidence points to the need to shift the research focus to the processive nature of teacher beliefs, and to revisit the role and significance of a digital humanity course with technology integration focus in changing teachers' beliefs of technology integration. The goal of this study is to fill in those gaps, in hope of providing insights into the complex systems of teacher beliefs and ways a teacher education course could contribute to the changes among ELT teachers.

This study

This study will adopt Cabaroglu and Roberts's (2000) framework of belief change processes (See Appendix Table A1) to qualitatively and longitudinally investigate the processes of belief change on technology integration among three pre-service ELT teachers in a digital humanity course. This study will aim to answer the following two research questions:

1. How did the three pre-service English teachers change their beliefs on technology integration in a digital humanity course?
2. What contextual factors affect the three pre-service English teachers' belief change processes?

Methods

The Context

This one-year, multiple case, qualitative study was conducted in a public American research university. The digital humanity course is a part of secondary teachers' accreditation curriculum. The Digital Humanities course was particularly designed to develop skills that help integrate digital tools at the secondary teaching level, which include ELT, Social Studies, Science, and Math teachers. The course provided opportunities for students to learn about and apply these technologies to instruction. The main assignments of the course included biweekly discussion forums, story of self, technology enhanced lesson plan, discussion leader, and education technology reflection. There were 24 students taking the course, among which three of them were pre-service ELT teachers. The students meet once per week for two and a half hours. As part of the curriculum, there was a packet of TPACK readings included in the existing course reading list.

Participants

The three ELT pre-service teachers were participants of this study. These three –Melody, Ella, and Eva (See Table 2) –had rich belief changes experiences in the pre- and exit- interviews and course assignments (lesson plans, biweekly reflective journals, and reflections). Each of the three participants

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represents a case (Stake, 1995). Each case constituted a unit of analysis. Table 2 lists the pseudonyms, race, and age of each participant.

Table 2. Focal Case Participants.

	Secondary School Level	Race	Age
Eva	Middle School	White	22
Melody	High School	White	28
Ella	High School	White	22

Note. Names are pseudonyms.

Data Collection

Data were collected using multiple methods, including interviews, reflective reading responses, reflective class responses, "the story of technology, my teaching, and me" essay, and technology enhanced lesson plans and revised lesson plans.

The Story of Self

The story of self refers to a story of "technology, teaching and me", which was a personal essay where students reflected on their technology learning and using experiences before taking the course. The essay was based on the social identities they belonged to and the communities they worked and associated with, and how that experience influenced their teaching beliefs and practices. Students were asked to select at least three domains (both internal and external aspects) to discuss their identities. Those aspects include race, class, gender, religion, age, sexual identity, and/or other social identities.

Interviews

Two semi-instructed interviews were carried out: first interview was conducted in the fall 2021 semester during the course in November, second interview was conducted at the end of spring semester of 2022. There were nine interview questions (please see Appendix B for interview questions). The interviewer asked the participants each question and follow-up questions were asked as well. Each interview lasted around 35 to 65 minutes. All the interviews were conducted and audiotaped by Author 2, and transcribed by Zoom transcript and Otter.ai (https://otter.ai). English was used in the interviews.

Biweekly Reflective Journals

There were seven biweekly reflective journals (mostly asked students to provide reading responses, and personal reflections on reading and classroom experiences), which consist of two parts: a brief summary of the readings of the week and a brief reflection on the readings. Students were required to write at least 150 words for each part and submit 300 words. The first three weeks, these biweekly reflective journals were submitted to a course management site (Blackboard) Wikis. Starting from week 4, due to the limitations of interactions, storage, and download features via Wikis, the biweekly reflective journals were moved to a Google classroom with Google folder and Google document.

Lesson Plan

Students were asked to write a lesson plan for the discipline that they were trained in. The participants' lesson plan in this study were all on teaching English. The lesson plan was required to start with listing learning objectives, specific goals (i.e., standards of learning), social justice standards, materials needed and time distribution. The main body of the lesson plan was encouraged

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to include the following sections: opening activities to activate prior knowledge and activate learners' interests, middle activities through which new knowledge were introduced and skills were practiced and closing activities where the pre-service teacher summarized what was taught. The lesson plan ended with information on accommodations, formative and summative assessment, and useful resources for students. After the lesson plan was completed, the pre-service teachers taught the lesson in an actual classroom. They were also encouraged to include "reflection and recommendation for future use" in the lesson plan. After the lesson plan was submitted to the instructor, feedback was provided and the pre-service teachers could revise the lesson plan and resubmit it to get a higher grade. Information on technology could appear in different places in the lesson plan, e.g., materials needed, opening, middle, and closing activities, and resources. Some pre-service teachers also reflected on the technology integration.

Data Analysis

This study used sensitizing concepts (Blumer, 1954) in extant theories within the belief change categories (Cabaroglu & Roberts, 2000, p. 393-398) and comprehensive SCT lens (Vygotsky, 1978). Through the sensitizing concepts and coding analysis, we developed "analytic schemes of the empirical world with which the given science is concerned" (Blumer, 1954, p. 3).

While coding, we followed Charmaz's (2014) suggestion and worked on three stages of coding: initial, focused, and axial. The different processes of writing qualitative codes (e.g., initial coding versus focused coding) offers researchers various ways of viewing and analyzing the same set of existing data. Our processes of initial, focused, and axial went through interweaved stages and are not necessarily linear. Charmaz (2014) also suggested that coding is spread out into different stages of the research process. We coded data in different stages of the research process: pre-writing initial data analysis, pre-writing group data coding and co-coding, during manuscript writing, and post-writing stages. According to Charmaz, a researcher uses open coding to closely read the language of participants--words, phrases, sentences, and chunks of expressions in Nvivo codes. We followed this guideline as well in our coding process.

In qualitative research, coding pushes researchers to examine the implicit and hidden meanings in the language of the participants (Saldaña, 2013) because researchers are putting themselves in the participants' views, standpoints, and actions when they are coding. Using systematic and flexible guidelines for coding, we wrote memos, categorized, defined, quoted, and developed categories, patterns, and themes to describe what is happening in the participants' processes of belief changes. When coding, categorizing, theming, and reporting the data, we stayed as open-minded as possible. The authors each coded interviews, lesson plans, biweekly reflective journals, and other documents. The interrater reliability was 92% based on the meaning of our initial codes. If there were disagreements on data codes, we discussed the data together and reached agreement via zoom calls. For example, in the analysis of the case of Melody, we had initial different codes on the revised lesson plan (See Appendix A Table A3). Author1 considered the changing belief demonstrated during the revision of the lesson plan's objectives being "elaboration/polishing", and the Author 3 considered being "awareness/confirmation". We had a zoom meeting and Author1, Author 2, and Author 3 discussed this disagreement on sensitizing concepts based on Cabaroglu & Roberts, 2000, p. 393-398). We reached agreement that it is more prominent for the code to be "elaboration/polishing" for Melody's lesson plan objectives' change.

Findings

In order to shed light on the complex and dynamic processes of the student teachers' belief transformation in their social-situated context, the research findings are presented case by case. This allows for a detailed analysis of the participants previous experiences of beliefs of technology use, and how their beliefs have been influenced and changed by and in the digital humanity course

Eva

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Eva grew up in a middle class family in a relatively affluent neighborhood in Virginia. She had a rich experience using technology. For example, she mentioned that she had access to a computer and internet since she was little. She was already using PowerPoint for presenting in Fifth Grader classes. She has a school laptop issued to her in both middle and high school, and had her personal laptop at the end of the high school (First interview, course story of self, and biweekly reflective journals). Before taking the digital humanity course, her beliefs included: (1) Not all students have the same background knowledge regarding technology (computers, phones, softwares, social media, and search engines so don't make assumptions about students' knowledge of and access to technology (First interview); and (2) she wants to design lessons to teach students' digital literacy (First interview). Her previous site teaching experience and her previous learning experience as a student also informed her of the importance of modeling and scaffolding the students' use of technology, as she stated in her interview:

> It is not great to just throw students into assignments where they have to use something like [technology]. So you definitely need to model and just in examples, of how to use it, because my teacher, Canva, she also has us to learn where you can create flyers or posters, or digital infographics online. (First interview)

Consolidation and Confirmation

One of the beliefs change processes that emerged for Eva during the course is consolidation and confirmation. When asked about the belief change regarding technology before and after reading the course readings, Eva stated that the course readings supported ideas that she already had. Irrespective of using technology as an assessment in language class (Borg, 2011), Eva shared that she loved the idea of asking the students to rewrite and create a video to share what they have learned, and she emphasized that she had been thinking about the similar idea before she took the course. Eva's engagement with TPACK readings confirmed and consolidated her previous beliefs of integrating technology into language teaching.

> I think they [the readings] really just supported ideas that I already had. I know, before we started reading those papers earlier in the semester, I was thinking of ways for lessons for my students to do with things they read, and how it like what sort of like artifact they could create. I was thinking of having them like make videos like telling stories, **and then I read the TPACK and it was almost exactly the same thing I was thinking of.** Yeah. I think, it was the middle school English section (refer to Hofer et al., 2015, Chapter 3 on middle school English teaching with technology). They had the students write the three little piggis story, like rewrite it their way, and then illustrate it and create a video to share with elementary school students. Um, so I really liked that idea. **And that was kind of something that I was thinking I would want to possibly incorporate** or at least, like, have them do a video. I was trying to think of a different audience for them to share it with other than just the teacher. So like other classes, or their parents, or something like that. **Yeah. So I think it definitely gave me some more ideas. Yeah. And then also just kind of supported thoughts that I already had.** (First interview)

Addition

Interacting with classmates also added new knowledge of technological tools for Eva. She learned many new tools from her classmates' presentations in the course, for example, Neo pets, Decks, Flipgrid, and Oregon Trail. She was also reflecting on how to incorporate some of the tools in her own teaching (Biweekly reflective journals).

> And another class Sarah also introduced something called Flipgrid, which she considered that would be really useful for English, "because you can just put, like words or phrases and have them like, create sentences of their own [via short video clips sharing]". (First interview)

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Her end of the semester lesson plan also showed influences from her cooperating teacher and site teaching. She asked her students to read an News article about Sherlock Holmes and answer questions in the graphic organizer on their note page in OneNote (Eva's lesson plan and end-of-semester reflection). Eva discussed the influence of her cooperating teacher, who uses Microsoft OneNote in all of her teaching.

Thus, Eva added new technological tools to her repertoire through the influence of class presentations, and mentors and site teaching.

Reversal

Besides consolidating existing beliefs and adding new beliefs, the digital humanity course also reversed some of Eva's previous beliefs (Cabaroglu & Robert, 2000). For example, Eva's views of using technology in teaching poetry has significantly changed. At the beginning she did not believe that technology could be integrated in the teaching of poetry, since it is a specific genre:

> **I'm not sure I'll be able to use any games** in my student teaching besides vocabulary games through sites like Blooket and Quizizz because I'll be having the students I teach read historical fiction novels and work on poetry. **I don't know of any games out there** that would help with the units that I am planning on teaching. (*Eva*'s bi-weekly reflection, November 14)

However, inspired by one of her readings, she abandoned her prior belief and adopted the new belief that technology, actually, could highly facilitate the teaching and learning of poetry (First interview). Moreover, she had already started to develop an initial plan of using videos in poetry learning activities (i.e., spoken word poetry activity).

> I plan on having them do **spoken word poetry**. So, at some point, I'm probably going to have them like **watch videos** of people doing spoken word. And then I'm either going to have them just **perform it** in class where I was thinking of maybe having them **record themselves** doing it if that is easier for them because some people it's especially middle school, it can be hard to stand up in front of the entire class and read a poem but I might give them the option of recording themselves doing it. And then we can share those videos. (*Eva*'s interview)

Disagreement

In terms of her belief about language teacher's knowledge of technology, Eva showed disagreement with a course reading which discussed pre-service teachers' TPACK confidence. Being a pre-service teacher who had prior teaching experience, Eva disagreed with the authors of the article (Albion et al., 2010), who may have assumed that teachers have good knowledge of the technology before they use it in their classes. Eva believed that many teachers, actually, used technology, which they did not know well. She stated:

> The authors of the Auditing the TPACK Confidence of Australian Pre-Service Teachers article (Albion et al., 2010) assume that if the teachers' responses indicate that their students used technology in the classroom, then that shows that the teacher has knowledge of that technology because "students will not be able to undertake the learning tasks with Information Communication Technology described by the items" if the teacher does not have that knowledge (Albion et al., 2010, p. 4). **However, I have had many classes where teachers have assigned work that involved using technology which they did not know how to use well or at all.** It is nice to assume that teachers are well-equipped to teach their students how to use new forms of technology or new websites, but how often do teachers actually take the time to explore these resources themselves so that they can effectively teach their students how to use them? (Bi-weekly journal reflection)

Consistent with Borg (2011), Eva's reflection was based on her prior experiences.

Through taking the digital humanity course, despite some of the disagreement with course readings, Eva's beliefs on using technology in language teaching have either been

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consolidated/confirmed or reversed (Yuan & Lee, 2014). She also added new beliefs about using technology to teach poetry in language classes (Cabaroglu & Roberts, 2000). Eva would like to continue to integrate technology into her teaching in the future. She would like to use online games and websites in language teaching so that her classe can be more exciting and engaging (Lee & James, 2018).

Melody

Unlike Eva, Melody did not have a lot of exposure to technology when she was little. She called herself "old school" in terms of technology use (Story of self).

> I'm more likely to remember it. I am still what many people would call "old school" when it comes to being a student in a classroom. I didn't get my first cell phone until I was in high school, and I didn't get my first laptop until I was in college. (Story of self)

However, Melody is not opposed to using technology in the classroom.

Elaboration and Polishing

Elaboration and polishing is a belief change process that was mainly evidenced in Melody's lesson plans. After submitting the first lesson plan in the middle of the semester, the professor suggested Melody consider more concrete learning objectives such as what the students will be able to do at the end of the class, and how technology could help facilitate teaching the lesson. Table 3 lists the original and revised lesson plans (due to limited space, we only listed objectives and middle activities section). A comparison of the two lesson plans showed the multiple ways that Melody elaborated and polished her original lesson plan. The following is a list of changes she made:

First, after receiving her professor's feedback, Melody listed clearly defined student learning outcomes (SLOs) (e.g., Brown, 2016) and added detailed narratives that thoroughly introduced the rationales behind each objective (Revised lesson plan) Specifically, in the objectives section in the old lesson plan, Melody merely described what the teacher will do (i.e., *Students will be assessed on their understanding of Part 1 of TKAM and will read Chapter 12*). As shown in Table A3 (Appendix A), in the revised lesson plan, Melody listed clear and concrete objectives of what the students will be able to do at the end of the class (Brown, 2016).

Second, in the designing of the activities in the lesson plans, it is evident that Melody's beliefs in using technology in teaching have been elaborated. In the first lesson plan, she designed a Jeopardy game, but it seems that she incorporated the game "for the sake of incorporating" (First lesson plan). She stated: "*This is a simple way to integrate technology into the classroom without feeling like it's awkward or forced and gives students a way to interact with the technology indirectly***.**" (First lesson plan). However, in the revised lesson plan, she elaborated on the affordances of Jeopardy game and her rationale for choosing this specific technological tool (Revised lesson plan, Appendix A, Table A3). She believed that the Jeopardy game is a good review tool because it is simple to use and it allows students to interact with other students and the teacher. Besides, Melody chose the Jeopardy game after taking into consideration the validity of the review game as a formative assessment too**l** (Gikandi et al., 2022) **(**Revised lesson plan, middle activities b.**)**. Lastly, through site teaching, Melody observed her student's use of the technology and reflected that the tool was fun and exciting to use.

Third, compared to the first lesson plan, Melody also elaborated her belief of how to integrate technology in an activity. In the first lesson plan, Melody stated that students would watch a video on code-switching and discuss it. However, in the revised lesson plan, she listed five discussion questions related to the video (Appendix, Table A3). This shows that Melody refined her current beliefs on the use of videos in language teaching. In summary, comparing the original lesson with the revised one, it is clear that Melody elaborated and polished her existing beliefs on lesson planning after taking in the feedback from the professor.

Ella

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Ella is a white female who grew up in an upper-class family in Virginia. Her parents were familiar with technology and her family had the newest and best phones, computers, gaming systems available as she grew up (Ella-Story of Self). Although Ella grew up with technologies, she felt that she was not as comfortable with them as many of her peers were. Thus, Ella was also eager to take additional courses on using technology in classrooms to make sure she was proficient in any programs when needed while teaching (Ella-Story of Self). Despite her easy access to technology, she was aware that there were huge disparities among students when it came to the level of access to technology (Story of self). She was strongly motivated to be a "best teacher" ("*I would still like to do as much as I possibly can to increase this knowledge and be the best possible teacher for my future students*", Ella-Story of self).

Awareness and Realization

Irrespective of using videos in language teaching, Ella gained more awareness of the benefits of using video games from the course readings. Before taking the digital humanity course, Ella mentioned that she was not aware of the benefits of using video games in teaching.

However, through reading and reflecting on the course readings, she realized that video games could be embedded in language teaching if appropriately designed. Moreover, one of the course readings also made her be more aware of how video games could cater to shy language learners. As a result, she realized the importance of accommodating learning styles into activity design (Maryono & Lengkanawati, 2022). She explained:

> And then you know, **after reading the chapter, and then we had the presentation last week.** You know, they gave a lot of good argument to introducing those kinds of things and how they can be beneficial in the classroom and then, you know, they were talking about in the chapter about how, you know, **kids can have different personalities online and that can be beneficial because kids are shy**, they can communicate how you know, in just different ways and **so I think that the textbook has had definitely has given some good information** (Bi-weekly Journal)

Addition

Similar to Eva, Ella also showed evidence of learning new constructs, resources, and ideas from, or inspired by her classmates in the course. Although Ella did not have experience writing lesson plans, she thinks it was helpful to read her classmates' lesson plans and to think about how to incorporate their ideas into her own lesson plans. She stated:

> The last class we were peer reviewing each other's technologically integrated lesson plans. Sometimes I think it is difficult to give suggestions on how to improve someone else's lesson plans because I have not had to write and create lesson plans for students until this year, so I am not super comfortable with it. **Something I do think is helpful is seeing everyone else's ideas and thinking about ways I can alter my classmates' ideas into my own.** I also think it is useful to see how other people set up their lesson plans and this gives me ideas on how to improve my own work. **After reviewing other people's lessons, I have a better understanding of how I want to continue to make my own lesson plans and I also have more ideas on how to integrate technology into my classroom.** I also enjoy working with people in different content areas than my own because it gives me a different perspective on how my students will be using technology in their classes outside of mine. (Second interview)

Other class activities such as classroom presentations also inspired Ella to learn new ideas and resources which she might use in her own teaching. Ella stated in one of bi-weekly reflections:

> So far I have enjoyed my classmates' presentations **because they are constantly showing the class new resources that we can all potentially use in our own classrooms**. I think this is really beneficial for everyone because not only are we all learning about new ways to

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> teach, but we are also getting to try everything firsthand and see if we think things would work well in a classroom setting. (Ella- Bi-weekly reflection, 11/14)

In summary, Ella continuously added new beliefs through the interaction with her classmates and engagement with course readings.

Discussion

This study examined the process of preservice ELTs' changing beliefs on technology integration during a Digital Humanity course in a teacher education program. Adopting Cabaroglu and Roberts's (2000) belief change processes framework, this study qualitatively examined the belief change processes of three ELT pre-service teachers in terms of technology integration in language teaching, with an aim of interpreting and understand the lived, nuanced, specific experiences of a group of preservice ELT teachers in a digital humanities course.

Processes of Belief Change: The Digital Humanities Course's Impact

Consistent with the existing belief change process identified in Cabaroglu and Roberts (2000) and Yuan and Lee (2014), we found that three ELT pre-service teachers experienced the following processes of change. Methodologically, complementing the existing studies via quantitative designs which revealed aspects of teachers' belief changes on TPACK (e.g., Cheng et al., 2022; Heath & Segal, 2021; Moon et al., 2022), this study revealed that a teacher training course with a technology integration focus in a teacher education program could exert influences on teacher beliefs on technology integration in language teaching((e.g., Borg, 2011; Yuan & Lee, 2014). Additionally, ELTpre-service teachers' beliefs were indeed nested in a dynamic system where sociocultural factors and teacher belief are highly intertwined (Vongkulluksn et al., 2020).

Overall, the results of this study add to the existing literature on the effectiveness of teacher education programs in impacting the beliefs of pre-service teachers and extend this line of research to ELT teachers. We agree with previous literature (e.g., Anderson et al., 2022; Borg, 2011; Tang et al., 2012) that teacher education can be a source of new beliefs for teachers. In this study, participants experienced **six** belief change processes: (1) awareness and realization, (2) consolidation and confirmation, (3) elaboration and polishing, (4) addition, (5) disagreement, and (6) reversal.

(1) Awareness and realization refer to the fact that pre-service teachers became fully aware of an idea, process or construct or picked up a new belief (Yuan & Lee, 2014) in a teacher practicum (e.g., in Yuan & Lee's 2014 study) or a teacher education course (such as in this study). In this study, Ella was not aware of using video games in language teaching because she had no experience of playing video games. However, reading course materials and observing her classmates' presentation enabled her to realize the potential benefits of using video games in language teaching. More importantly, Ella reflected that video games might be valuable considering the fact that shy learners may like playing them. This realization may be deemed important considering the fact that Ella is a pre-service teacher and an early career teacher (Ulla, 2022). As a pre-service teacher, this realization, awareness, and change of beliefs showed the participant's adaptability to the context, and her willingness to negotiate her preconceived beliefs about technology integration in language teaching (Ulla, 2022).

(2) Through *confirmation and consolidation*, preservice teachers strengthened their prior beliefs by observing a consistency between these beliefs and the new information (Yuan & Lee, 2014). Eva's belief in integrating technology in teaching English was confirmed by reading course materials. This was in agreement with the finding of Moon et al. (2022)'s study where pre-service teachers solidified their technology integration belief through hands-on practice.

(3) *Elaboration and polishing* refers to the fact that pre-service teachers refine their existing beliefs by elaborating relevant knowledge and connecting with new input (Yuan & Lee, 2014). In this study, Melody elaborated and polished her lesson plan based on her professor's feedback. Planning a lesson is a complex process and has been viewed as a challenging task by pre-service teachers (Sahin-Taskin, 2017). Developing preservice teachers' planning skills is considered very important in raising effective teachers (Sahin-Taskin, 2017). Besides professor feedbacks, previous research has discussed other specific technological integration support for

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pre-service teachers since different kinds of support (e.g., receiving support materials that presented technological, pedagogical and content information separately vs. materials in which the technological and pedagogical information was integrated) may result in better technology integration practices (Noortje et al., 2019).

(4) Disagreement took place when the student teachers rejected their previously held beliefs
(5) and (5) reversal are both related to denying a prior belief and embracing a new one (Yuan & Lee, 2014).
(6) Addition refers to student teachers adding new constructs to their existing beliefs (Cabaroglu & Roberts, 2000).

Through a longitudinal and qualitative design, this study extends these existing scholarship by providing rich descriptions of how these changes happened in context. The findings of this study are expected to have both theoretical and practical implications for future ELT teacher education programs and teacher educators to adopt and purposefully design teacher education courses for training preservice teachers to be technology integration change agents for the future of ELT. As a result, we echo with Moon and colleagues (2022) that it is urgent to implement purposeful training for preservice teachers' technology integration because their beliefs profoundly influenced their teaching practices.

Diverse Factors Impacted the Changing Beliefs

Our study testifies to the transformative influence that teacher education programs can exert on student teachers' cognitive development (e.g., Nazari & Xodabande, 2022; Ulla, 2022; Borg, 2003). Drawing on sociocultural perspectives, a range of contributing factors can be identified that contributed to the processes of belief change during the digital humanity course.

This study supports the argument that sociocultural factors influence preservice teachers' change of beliefs (e.g., Qiu et al., 2021; Gebhard, 2009; Yuan & Lee, 2014). Specifically, we echo Yuan and Lee (2014) in their several categories of discussions that preservice teachers' change of beliefs can be attributed to social-, other-, and self-mediated factors. Please see Table 4 for examples of these changes of beliefs and examples of attributing factors of social-, other-, and self-mediations.

We agree with Yuan and Lee (2014) that teachers' beliefs are not predetermined or stable, but open to change. Specifically, we echo strongly with the sociocultural theory (Vygotsky, 1978) perspective of social-, other-, and self-mediated factors, which we found to deeply influence the teachers' beliefs. We found our case participants changed their beliefs due to social factors such as course readings, their professor's feedback and support, course assignments like lesson plan and instructor's feedback, classmates' input and collaborations, their own self-reflective thinking, their prior technology use experience, their previous technology integration experience, and their field experiences with cooperative teachers and students.

Moreover, this study offered some useful guidance for future various ELT preservice teacher training. We provide evidence and examples of how technology integration training for preservice teachers can integrate their context-based opportunities. For example, practitioners of teacher trainers can design curriculum based on their participants' previous learning experience so that preservice teachers can engage in meaningful feedback and input on learning with others in a technology integration-oriented course.

Additionally, this study responded to the call from Pellikka and colleagues (2022), who found that teachers' beliefs were related to their cognitive and affective dimensions and occurred in different stages of teacher education by unpacking these cognitive and affective dimensions of changes and related sociocultural factors. Our teachers' changing beliefs were non-liner, intertwined in multiple categories (e.g., elaboration, addition, and reversal could be simultaneously happening in one lesson plan writing and revising). We also agree with Moon and colleagues (2022) that if teachers can be given practices in designing lessons and curriculum, they would be provided valuable opportunities for positive beliefs changes and becoming change agents due to the course influences such as readings, feedback from professor, and peer input.

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Overall, this study contributed to the ELT teacher education field by offering specific examples of belief changes in the interactive steps of mediation including social-, other-, and self-mediation (Lantolf, 1994). Our participants engaged in social-mediation for belief changes such as during their interaction with others (such as peers, cooperative teachers, classmates, students and friends). Our preservice teacher participants also had other-mediation facilitating their change using artifacts, such as course readings, course presentations, and classroom discussions.. Lastly, our participants were constantly self-mediating their beliefs, developing beliefs in their cognitive and intra-psychological processes. Considering the challenges teachers face in putting theory into practice for technology integration, we conclude that teacher education research pays attention to challenges of belief changes, struggles of current new teachers, and struggles they have during course work of training them to become teaching professionals. The field has yet to explore more and fully attend to the changing nature of technological and social aspects of professional learning beyond the classroom.

Conclusion

In this article, we highlighted the experiences of three cases of preservice ELT teachers in their processes of belief changes by exploring nuanced and detailed qualitative data from multiple sources: story of self, interviews, biweekly reflective journal reflections, lesson plans, end-of-semester reflections and other documents. Via the vivid qualitative data, we revealed that our case participants' technology integration belief is not static, but rather they are fluid, constantly changing, and can be positively shaped by their digital humanities course. Moreover, the findings of the study show that student teachers' beliefs experienced different processes of change during course processes, including elaboration and polishing, confirmation and consolidation, awareness and realization, addition, disagreement and reversal. There are many sociocultural factors that contributed to these changes: social-, other- and self-mediated factors. The paper concludes that while it remains to be seen how other processes and social factors facilitate belief changes that were not captured in this study, the teacher education program's course experience deeply shaped the belief change of technology integration process and promoted preservice ELT teachers' cognitive development. We call for teacher educators to provide an open and flexible technology integration curriculum to allow for preservice teachers to equip their technology integration skills and so that they can transform to support our future generations of digital citizens.

Appendix A

Table A1. Summary Of Belief Change Processes (Cabaroglu & Roberts, 2000, P. 393-398) And (Yuan & Lee, 2014).

Belief change category	The distinctive features of each category
awareness/realization	Student teachers become fully aware of a construct, idea, or process
consolidation/confirmation	Student teachers perceive a consistency between existing beliefs and newly presented information in the learning process
elaboration/polishing	Student teachers refine their existing beliefs by elaborating relevant knowledge and/or connecting with new input
addition	Student teachers add new constructs to their existing belief
Re-ordering	Student teachers rearrange the importance of their beliefs
Re-labelling	Student teachers add a new term for a belief
Linking-up	Student teachers make a new connection between two beliefs

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Disagreement	Student teachers abandon an old belief and embrace a new one
Reversal	Student teachers adopt a belief that seems to deny a former one (a more extreme form of disagreement)
Pseudo change	Student teachers perceive a belief to be important but inappropriate or inapplicable to a current context
No change	Student teachers experience no apparent change or development in their beliefs

Table A3. Melody's Lesson Plan Revisions Compared With Her First Lesson Plan.

	First Lesson plan	Revised Lesson plan
Objectives After discussion, elaboration / Polishing(longer, more)	*Students will be assessed on their understanding of Part 1 of TKAM and will read Chapter 12.*	• Students will **participate** in an online Jeopardy game (led by the teacher) to review for the quiz and **demonstrate their knowledge** of Part 1 of the novel (including what the themes are and how they relate to the main characters and give students a better understanding of these characters). • Students will then **establish their understanding** of Part 1 of TKAM through the quiz. • Students will **view** a short video clip about a little boy talking about how he talks differently with his intramural basketball team versus at his school and **exhibit their understanding** by **critically thinking about** and **discussing** the video clip during a class discussion, and **filling out** a code-switching handout.
Middle activities	1. Students will review for TKAM Part 1 Quiz (30 minutes).	
_	First lesson plan	Revised Lesson plan
	a.The class will be split into two groups. One group will play an online Jeopardy review led by teacher. **This is a simple way to integrate technology into the classroom without feeling like it's awkward or forced and gives students a way to interact with the technology indirectly.** The second group will complete a book based scavenger hunt and fill out a	a. The class will be split into two groups by the teacher. In this case, the students on the right side of the room made up one group and the students on the right side of the room made up the second group. One group will play an online Jeopardy review led by the teacher. **This is a simple way to integrate technology into the classroom without feeling like it's awkward or forced and gives students a way to interact with each other and the teacher through technology.** The second group will complete a book-based scavenger hunt by finding quotes in the novel to support questions on the handout. b. Although I could use another way to review for a quiz, I think online Jeopardy is **a good review tool** because it gets the students **interacting** with each other. Just like the real game of Jeopardy, the board is viewed in front of the

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handout based on their findings.	students and the text is large, so it is **easy to see**. The statements/answers **covered** the content that was on the quiz **thoroughly**, and helped the students **think through** the material. Because there **isn't a time constraint** on an online Jeopardy review game, when they got something wrong, we took a second to **discuss and review** the correct answer. The students **were engaged and excited** to be using this tool as review and from what I observed didn't seem to be nervous, which I think is important before a quiz. c. If I were to use a **different activity** or tool(s) as quiz review, I would probably do **rotating stations**. At least one of these stations would integrate technology in some way. Possibly in the form of a matching game to answer questions about characters or the characteristics or characters. I think that would be **fun** for the students and **successful**, not only to integrate technology that is **useful**, but **provides a thorough review** when paired with other review tools.
3.Students will watch a short video clip about code-switching, followed by a discussion analyzing the video and how it relates to code-switching in relation to TKAM.	3. Students will watch a short video clip about code-switching, followed by a discussion analyzing the video and how it relates to code-switching in relation to TKAM **and how they see it in their lives and their school.** Questions that will be asked to begin the conversation about the video will be: • What stood out to you in the video? Why? • What do you notice about the little boy and his multiple environments? • Why do you think that people talk differently to different people? • **Does the video remind you in any way of your school/other environments? Provide an example.** • **Is there anything you relate to? Why?** • Students will be reminded to be **respectful** when discussing differences between people.

Table A4. Summary of Belief Change Processes and Example of Influencing Factors.

Category	Features of each category	Found in participants	Examples of factors influencing the change
Awareness/ realization	Student teachers become fully aware of a construct, idea, or process	Ella	**Social-mediated factors** (e.g., course readings) (Data source: First interview)
Consolidation/ confirmation	Student teachers perceive a consistency between existing beliefs and newly	Eva	**Social-mediated factors** (e.g., Course readings) gave Eva more ideas, supporting **self-mediated factors** (e.g., her existing thoughts) (Data source: First and Second interview)

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	presented information in the learning process		
Elaboration/ polishing	Student teachers refine their existing beliefs by elaborating relevant knowledge and/or connecting with new input	Melody	**Other-mediated factors** (e.g., professors' feedback) inspired Melody to elaborate and polish her learning objectives and activities design in the revised lesson plan (Data source: lesson plan)
Addition	Student teachers add new constructs to their existing belief	Eva & Ella	Through **other-mediated factors** (e.g., classmates and collaborating instructors), Eva learned new technological tools (Data source: first interview; biweekly reflective journals) Through **social-mediated factors** (e.g., classmates' lesson plans; classroom presentations) and **other mediated factors** (e.g., classmates), Ella learned new technological resources (Data source: bi-weekly reflective journals)
Disagreement	Student teachers abandon an old belief and embrace a new one	Eva	**Other-mediated factors** (e.g., course readings) and **self-mediated factors** (e.g, previous teaching experience). Being a pre-service teacher who had prior teaching experience, Eva disagreed that the authors of the article may have assumed that teachers have good knowledge of the technology before they use it in their classes. Eva believed many teachers used technology which they did not know well (Data source: Second interviews)
Reversal	Student teachers adopt a belief that seems to deny a former one (a more extreme form of disagreement)	Eva	**Social-mediated** (e.g., course readings), **other-mediated** (e.g., classmates), and **self-mediated** factors (e.g., prior experience). Inspired by course readings, Eva changed her prior belief of not using technology in the teaching of poetry; she had a clear idea of teaching poetry by using technology (social-, other-, and self-mediated factors) (Data sources: Bi-weekly reflection; interview)

Appendix B

Interview questions

1.What teaching experiences did you have? Could you describe your educational technology and teaching experiences? Could you give me some examples? How did you feel about your educational technology experiences and teaching in the past?

2.What educational technology did you use in your teaching? How did you use it? How did you describe these experiences?

3.Could you describe your context of teaching using technology and how that impacted your teaching?

*Context is a broad word, it could refer to a system of you, your sociocultural circles, your family and friends, supervisors, cooperative teacher, faculty/professors, emotional and physical

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environments, communities, larger social and cultural movements, historical pathways and periods, larger globalization, etc...

4. How do you understand pedagogy in teaching using technology? How about content?

5. We are reading TPACK papers. How did you think about technology integration before this course? How did you thinking change after taking this course?

6. How did our course readings and activities change and impact you?

7.Can you give a typical day at your observation/student teaching site? How did you perceive that day of educational technology? What was your experience in a typical day that you described?

8.Can you give an example of a typical moment (10-15 minutes) that you are teaching and using technology? How did you feel that moment? Why this moment is important to you?

9.What is your plan of using technology in your future teaching?

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