Using Mind Maps to Evaluate Preservice Teachers' Growth in Teaching English Language Learners

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ABSTRACT

The purpose of this research was to examine the use of mind-mapping as a classroom strategy for identifying and assessing the knowledge base of pre-service teachers as they prepare to work with English Learners (ELs) in mainstream classrooms. Using mind maps, the study identified the pre-service teachers' knowledge base on ELs at the beginning of a 3-week service-learning course and in what areas they were able to grow. Using an action research framework and thematic analysis of the phrases written on mind maps, researchers were able to identify eleven themes prioritized by the pre-service teachers. Analysis of the mind maps revealed that pre-service teachers grew in ways that developed their knowledge of 1) supporting ELs through specific classroom strategies, 2) building awareness of and appreciating cultural diversity, 3) approaching language learning with an asset-oriented mindset, and 4) gaining a basic understanding of second language acquisition. The study found that mind maps are a helpful tool for identifying what pre-service teachers find meaningful about working with ELs as well as a source for data to inform teacher educators as they design and implement curriculum and experiences in teacher preparation that focus on ELs.

Key Words: *Mind Maps, Teacher Preparation, English Learners*

Introduction

Over five million students in the United States are considered English Learners (EL)

(NCES, 2020). Despite this being ten percent of all school-aged children, there is a lack of

training on this unique population among mainstream pre-service teachers (Education

Commission of the States, 2014; Gándara & Santibañez, 2016; Leider et al., 2021). The

mainstream pre-service teachers' training on ELs varies greatly from state to state (Lopez et al.,

2013; Samson & Collins, 2012) and uses a variety of strategies to help pre-service teachers gain

the knowledge and skills needed in this area, ranging from instruction on English linguistics

(Lucas et al., 2008; Gándara & Santibañez, 2016; Okhremtchouk & Sellu, 2019), the use of field

experiences in classrooms or communities (Hildenbrand, 2015; Bollin et al., 2007; Tinkler, 2019;

Lindahl, 2022), to specific classroom assignments like guided reflection (Markos, 2012;

Sugimoto et al. 2017).

With a variety of ways to design, implement, and assess instruction on ELs, teacher

educators must consider what they are required to do based on their state standards for teacher

preparation and how they can do so within the constraints of their preparation programs. This

study considers what background knowledge general education pre-service teachers had about

ELs, as well as what they found meaningful and memorable after participating in a course on

ELs. With this goal in mind, the authors developed an action research project to explore the use

of mind maps as a tool in identifying and assessing pre-service teachers' knowledge about ELs

after participating in a three-week intensive service-learning course on ELs. This article is part of

a larger study that investigated how pre-service teachers learn to serve ELs in mainstream

classrooms.

Purpose

Using Mind Maps

The purpose of this study was to address the use of mind-mapping as a classroom strategy for evaluating the knowledge base of pre-service teachers as they prepare to work with ELs in general education classrooms. The study considers the strategy of mind mapping and what it tells teacher educators about pre-service teachers' growth of EL knowledge during teacher preparation coursework.

Background

Mind mapping (Arulselvi, 2017), also referred to as *group process mapping* (Rouech et al., 202) or *concept mapping (*Golightly & Norris, 2017), is a strategy used by teachers to help students visualize their knowledge. When creating maps, students are instructed to write the information that they know on paper and use keywords, symbols, and lines to simplify the drawing and form a map (Arulselvi, 2017). Studies have been conducted to measure the benefits of using mind maps in educational settings of different disciplines and grade levels. Mind maps have been used in both STEM and non-STEM fields, independent work, and all grade levels (Schroeder et al., 2018; Arulselvi, 2017). Arulsevi (2017) lists several ways educators can use mind maps, including taking notes in lectures, showing relationship between concepts, brainstorming, planning for writing tasks like essays, organizing ideas, creative problem solving, and reviewing/evaluating key learning (ps. 61-62).

Mind maps can be helpful in evaluating knowledge that students had before a course and after a course (Rouech et al., 2021; Arulselvi, 2017; Williams, 2004). These maps assist in measuring the growth of students (Rouech et al., 2021) as well as measuring their understanding of course concepts (Arulselvi, 2017; Golightly & Norris, 2017; Subramaniam, 2022). The effectiveness of mind maps was tested in a business and economics statistics course in which the researcher found that the process of building the mind map itself provided students with skills

such as analyzing data, organizing information, etc., which encouraged the students to think deeply about connections between different ideas (Chiou, 2009).

Mind maps can address what learning or concepts are most memorable about a course, reveal gaps of information in student learning, allow students to analyze their own knowledge, and help students form links between old and new knowledge. Therefore, mind mapping was used as a strategy for this study to evaluate the knowledge base of pre-service teachers as they prepare to work with ELs in general education classrooms. By asking pre-service teachers to make mind maps on the most memorable concepts from their experiences working with ELs, researchers were able to examine their knowledge base and use this information to plan future curriculum and supports for pre-service teachers.

Research Questions

This study was an action research project (Mills, 2018) that occurred in a three-week intensive service-learning course on ELs that occurred during a May term at a small, private, liberal arts university located in the Midwest of the United States. This study was guided by the following research questions:

1) What do mainstream pre-service teachers find meaningful and/or memorable from their experiences working and learning with ELs?

2) How can mind maps inform teacher preparation curriculum on supporting ELs?

Methodology

The study used action research (Mills, 2018) to discover what pre-service teachers know about ELs and what they retained after taking a three-week intensive service-learning course.

Context

The study and data collection occurred in an elective class on service-learning and ELs that was offered during the university's three-week intensive May term. The course was delivered at *Midwest Elementary School* (names in italics are pseudonyms), an elementary school near the university campus in which over 50 percent of learners are classified as EL (IDOE). The course met for three hours per day, five days per week, for three weeks during May. Pre-service teachers enrolled in the course spent two hours each day participating in service-learning activities that involved supporting ELs in a general education elementary classroom. Then students attended a one-hour class where they debriefed and reflected on their daily classroom experience as well as learned about various topics regarding supporting ELs, such as EL diversity, knowledge of English linguistics and second language acquisition, classroom strategies, etc.

Participants

Participants enrolled in the course who were pre-service teachers were eligible for the study (n=12). Ten participants were elementary education majors and two were studying secondary education. All participants were undergraduate students at the end of their freshman or sophomore year of university studies. Two pre-service teachers identified as African American, three as Latinx, and seven as Caucasian. All participants identified as female. Each pre-service teacher consented to be part of the study. One participant was excluded from the study because she did not complete the second mind map, so the final participants were n=11.

Data Collection

Participants completed their first mind map (MM1) on the first day of the course. Participants were given poster-sized paper and makers and asked to create a mind map of everything they knew or thought they knew about ELs. Their instructor provided samples of

what a mind map looked like using a topic other than ELs. Students were encouraged to write English Learners in the middle of their poster and then write down any information about ELs that came to mind. Participants were given approximately 15 minutes to complete their mind maps. The mind maps were collected by the course instructor.

Next, participants spent three weeks volunteering in an elementary school classroom, supporting ELs for 2 hours per day and attending classes on ELs for 1 hour per day. On the last day of the three-week class, participants completed their second mind map (MM2). Participants were again given poster-sized paper and markers and asked to create a mind map of everything they knew or thought they knew about ELs after participating in the course. Participants were asked to not use any texts or notes, but to recall learning from memory. Again, participants were given approximately 15 minutes to complete their mind maps and they were collected by the course instructor. The mind maps were photographed, and images were saved for data organization and analysis purposes. See Figure 1.
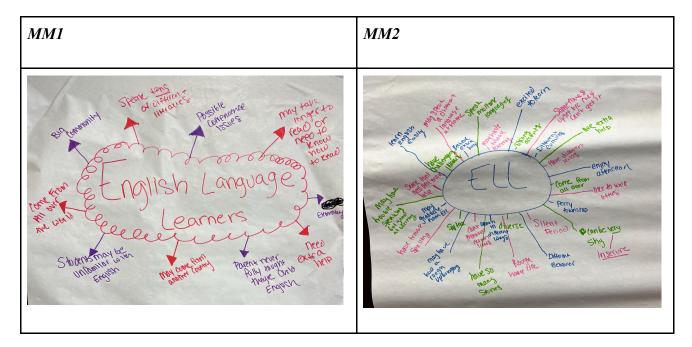
Figure 1: Sample MM1 & MM2

MM1	*MM2*

Data Analysis

The researchers took a qualitative approach to data analysis, using thematic analysis (Braun & Clark, 2006) to identify salient themes that appeared in the mind map data sets. Each mind map was transcribed into a database that listed the wording/concepts each participant wrote on their mind map. Researchers then used open coding to code each item listed on the mind maps. These initial codes were then reviewed for a second round of coding in which researchers combined codes, modified codes, deleted codes, and re-classified ideas. During this time, the researchers conferred with each other about the classification of each code into broader categories and subcategories.

Findings & Discussion

The findings and discussion for this study are organized around the two research questions: 1) What do mainstream pre-service teachers find meaningful and/or memorable from their experiences working and learning with ELs? 2) How can mind maps inform teacher preparation curriculum on supporting ELs?

Capturing the memorable with mind maps

By collecting mind maps at the beginning of the course and again at the end, researchers were able to identify the knowledge base of pre-service teachers as they began the course as well as what concepts were memorable to pre-service teachers at the end. From the analysis of MM1, 95 items were written across eleven participant mind maps (8.6 item average per map). These 95 items were then condensed into 10 different categories/themes.

MM2 revealed an expanding and deepening of knowledge regarding working with ELs. After participating in the three-week course, participants wrote 173 phrases versus 95 on MM1, showing an increase of 78 phrases (an 82.1 percent increase of items mentioned overall between

MM1 and MM2). Additionally, the phrases were often more detailed, specific, and elaborate than in MM1. Figure 2 shows the 11 themes that emerged from the coding of MM2. Ten themes were found in MM1, plus an additional theme that emerged *Language Levels*. See Table 1.

Table 1: Themes, Definitions, and Examples

Theme	Definitions	Examples
ELs Needs	Phrases that capture general or specific learning needs of students	- Need different approaches to learning - Need extra resources - Students often need modified instruction to meet their academic and social-emotional needs
Diverse group	Phrases that address diversity, culture, nationality	- Come from all over the world - Don't all speak the same language - Different cultures
Environment	Phrases that address the classroom/learning environment	- Create good classroom environment/climate - Supportive environment - make it inclusive
Strategies	Phrases that address general or specific strategies that educators can use to meet EL needs (may focus on literacy strategies geared toward reading, writing, listening, speaking or more general pedagogical strategies)	- Often benefit from visuals when given explanations + content - One-on-one with students - Build off what they know to add more concepts/more ideas
Language barrier	Phrases that address ability to students to communicate in English	- Students sometimes hold back in the classroom due to communication barriers - Language Barrier - Inability to communicate
Definitions	Phrases that simply define what EL is, stands for, and/or how students are classified as EL	- English is their second language - Students have to take ELL classes
Models	Phrases that address educational models commonly	- Pull out + push in methods - Bilingual education

	found in schools to provide EL supports	• Sheltered instruction
Family	Phrases that address specifically the parents, families, or home lives of students	• Parents sometimes need help • May speak a different language at home • Parent involvement is sometimes tough with ELL's due to communication barriers and different cultural environments
Testing	Phrases that address WIDA testing, EL standards and/or standardized testing	• WIDA, Standardized testing (Used to meet same standards) • WIDA • There is a test that determines if the student needs ELL
Linguistics/ SLA	Phrases that address stages of language acquisition or English language characteristics	• Morphology - students leave out ending words sometimes (dog-dogs) • Silent period is common • Lexicon
Language Levels	Phrases that address the levels of language acquisition, typically as understood through WIDA's proficiency levels	• 6 different levels • Proficiency levels

Before beginning the course, pre-service teachers had basic background knowledge of working with ELs as demonstrated by MM1. In their current teacher preparation program, there is little instruction on ELs, so it is not surprising that they would have general or vague knowledge of ELs. On MM1 participants often wrote one word or shorter phrases and then in MM2, expanded their thoughts. For example, on MM1 there was the phrase "language barrier" but in MM2, participants were more expressive, focusing on the idea that, due to the language barrier, ELs "need help learning English + applying it to the content they are learning." Another example from MMI was the idea of "need more support" which on MM2 looked like phrases such as "build off what they know to add more concepts/more ideas" or "balance of reading, writing, speaking, listening".

Pre-service teachers were also early in their preparation coursework when they completed this supplemental course. However, throughout the course, they were able to grow substantially in their knowledge and experience working with ELs as evidenced by the mind maps. Analyzing pre- and post-mind maps allowed teacher preparator educators to see growth if various areas, as shown in Table 2.

Table 2: Comparison of MM1 and MM2 Themes

Theme	MM1 Codes	MM2 Codes	Theme	MM1 Codes	MM2 Codes
ELs Needs	24	23	Models	6	11
Diverse group	16	37	Family	6	5
Environment	12	8	Testing	3	6
Strategies	12	52	Linguistics/SLA	1	13
Language barrier	9	2	Language Levels	0	13
Definitions	6	3	**Totals**	**95**	**173**

Exploring the Themes

To address the research question, *What do mainstream pre-service teachers find meaningful and/or memorable from their experiences working and learning with ELs?,* we explored in more detail the most common themes and/or the themes with the most growth, including *EL Needs, Diverse Group, Strategies, Language Barrier & Language Levels,* and *Linguistics/SLA.*

EL Needs

The most prominent theme found in the MM1 data *EL Needs*, which focused on the idea that ELs need extra time and support in the classroom. This theme was mentioned 24 times by nine participants. Before they started their course, these participants identified that ELs benefit

from modified instructions, additional time and resources, and more support from teachers.

Examples of phrases from the participants included:

- *Need extra help and guidance in order to succeed*

- *Need different approaches to learning*

- *Students often need modified instruction to meet their academic and social-emotional needs*

On MM2 *EL Needs* was mentioned 23 times. Subcategories in this theme included: From the Teacher (11 mentions), Social-Emotional (7 mentions), Support, Resources, Help (5 mentions). Key phrases in the *EL Needs* category included:

- *Do not limit students to resources. Give everything they need to succeed*

- *Need more support emotionally + academically*

The theme of EL needs showed little growth between MM1 and MM2 in terms of quantity of times mentions as well as sophistication of language used to describe needs. This shows teacher educators that the pre-service teachers had basic awareness of EL needs in the classroom going into the course and this stayed consistent throughout the course.

Diverse Group

Another theme from the MM1 data is that ELs are typically considered a diverse group. Participants mentioned the theme of *Diverse Group* 14 times before starting the EL course. Common subcategories under *Diverse Groups* included: ELs speak multiple languages, most ELs speak Spanish, and ELs can be born both in and out of the United States. Examples of phrases from the participants included:

- *Come from different ethnicity/race*

- *Come from all over the world*

- *Culturally unique vocabulary*

In the MM2 data, *Diverse Group* had 37 mentions. Again, subcategories emerged as well for *Diverse Group*, such as Individuals (20 mentions), Culture (5 mentions), Place (5 mentions), Language (4 mentions), and Diversity (3 mentions). Some phrases in the *Diverse Group* category were as follows:

- *Come from many different cultures + backgrounds*

- *Speak many different languages*

The growth in this theme points to the role of the 3-week intensive field experience working hands-on with an actual group of ELs, which showcased the diversity that ELs have among themselves. Pre-service teachers need practical experience working with ELs, and when three-week teacher programs provide instruction on cultural competency purely in a classroom and theoretical setting, it does not suffice (Scott & Scott, 2015). In this case, having participants work with culturally and linguistically diverse students, they were able to grow their cultural competence, and this awareness was reflected in their MM2s.

Strategies

In MM1, participants mentioned *Strategies* to support/accommodate ELs 12 times. Visuals were a very common subcategory for *Strategies* along with one-on-one teaching and smooth transitions. The importance of strategies for support and accommodation was indicated through the following phrases:

- *Often learn better with visuals such as pictures to learn what words mean*

- *Give directions in more than just one way*

In the MM2 data was *Strategies* was the most prominent theme with 52 mentions. Sub-themes also emerged within the categories and included: Writing (12 mentions), General (10

mentions), Speaking (9 mentions), Visuals (8 mentions), Reading (6 mentions), Variety (4 mentions), Modified Instructions & Directions (2 mentions), and One-on-One (1 mention). Examples of key phrases from the participants were:

- *Build off what they know to add more concepts/more ideas*

- *Don't make them read things above their reading level*

- *Balance of reading, writing, speaking, listening*

In this study, the theme with the biggest growth between MM1 and MM2 was *Strategies* for working with ELs. The participants worked in an elementary school for two hours a day for the three-week duration of the course, therefore it was not surprising that strategies were at the forefront of the pre-service teachers' minds. Field experiences are known to play a key role in the preparation of teachers to work with ELs (Sugimoto, 2017; Huerta, 2022; Schultz, 2020). During this field experience, participants were learning strategies from both the course content and their host elementary host teachers and then actively applying them on a day-to-day basis. The marrying of course content and application that happens during purposeful field experiences helped the participants to both recall and prioritize strategies they learned when completing MM2. The participants' ability to make meaning during their experience was connected to serving ELs in an authentic classroom and in authentic ways.

Language Barrier & Language Levels

Language Barrier which was mentioned nine times. Most participants highlighted that ELs typically do not know, and struggle with English. Phrases that indicated a language barrier for ELs included:

- *Inability to communicate*

- *Students sometimes hold back in the classroom due to communication barriers*

- *Students may be unfamiliar with English*

MM2 showed that in addition to being aware of the diversity of ELs, participants were also shifting to approaching teaching ELs with a more asset-oriented mindset. For example, on MM1, *Language Barrier* was mentioned nine times, and then on MM2 there were only two mentions. This change represents moving pre-service teachers from the deficit perspective of seeing ELs as lacking language and having problems/barriers to an asset-oriented approach of knowing at what level ELs start, how they can grow, and seeing opportunities. This move to a more asset-oriented mindset is reflected not only in the decrease of seeing lack of English as a barrier but also in the increase on MM2 with the emergence of the theme of *Language Levels* with 13 mentions. A basic understanding of language levels allowed participants to accept and honor the students' current levels and what they can do at those levels. Instead of seeing language as a barrier, the saw their various levels as assets and a starting point from which to grow. This moved them toward a more asset-oriented perspective and a more culturally sustaining view of the students.

Linguistics/SLA

Linguistics/SLA was another theme in the MM2 data with 13 mentions, growing from only 1 mention of MM1. This theme did not have any subcategories. Key terms for Linguistics/SLA include:

- *Silent period + wait time*

- *Lexicon*

- *Morphology - students leave out ending words sometimes (dog-dogs)*

An increase from one to 13 mentions reflected that pre-service teachers had little prior knowledge of the role of second language acquisition before the course, but that the information

they learned was relevant and memorable to them at the end of the course. This growth is important because Standard 2 of the *Indiana Content Standards for Educators: English Learners* requires that teachers of ELs "have a broad and comprehensive understanding of principles of first- and second-language acquisition and development as applied to EL instruction and assessment" (IDOE, 2010).

In summary, through the exploration of these prominent themes, we found that between MM1 and MM2, pre-service teachers prioritized and grew in ways that developed their knowledge of 1) supporting ELs through specific classroom strategies, 2) building awareness of and appreciating diversity, 3) approaching language learning with an asset-oriented mindset, and 4) gaining a basic understanding of second language acquisition.

Informing teacher preparation curriculum on supporting ELs

Using mind maps, this study identified what the pre-service teachers' knowledge base on ELs consisted of at the beginning of a 3-week service-learning course and in what areas they were able to grow. By doing mind maps from memory and within a 15-minute time frame, pre-service teachers ultimately listed items/concepts that they identified as most relevant and/or memorable. Pre-service teachers mentioned 10 different themes at the beginning of the course on MM1 and those same themes were found again on MM2, with the addition of only one theme, *Language Levels*. This indicated to teacher educators that pre-service teachers had basic knowledge of many of the themes that would be covered in the course when it began. As a survey course which only consistent of 15 hours of content instruction (30 hours were a service-learning field experience), pre-service teachers were not able to go in depth on many topics during the course. Instead, they received instruction on many different themes including second language acquisition theories, historical and legal considerations, models of EL education, etc.

Despite the limited contact with each theme, the MM2 showed increased growth of knowledge in most themes.

Using mind maps as a tool to capture the learning of pre-service teachers allowed teacher educators to identify what themes pre-service teachers prioritized and then use this information to modify curriculum and advocate for more coursework on working with ELs. For example, the mind maps showed that from MM1 to MM2 pre-service teachers prioritized and grew in ways that developed their knowledge of 1) supporting ELs through specific classroom strategies, 2) building awareness of and appreciating diversity, 3) approaching language learning with an asset-oriented mindset, and 4) gaining a basic understanding of second language acquisition. This information was then used to see what teacher educator standards were captured effectively through the course and what areas needed improved or increased instruction. The mind maps provided information that was used to both modify the course for future semesters and inform teacher educators what content knowledge and skills on working with ELs could be integrated in other teacher preparation coursework. Also, the growth of pre-service teacher knowledge that was reflected on the mind maps after participating in a targeted course on ELs showed the benefit of including a stand-alone course on ELs into teacher preparation curriculum, which is advocated for by the Indiana affiliate chapter of the professional organization Teaching English to Speakers of Other Languages (INTESOL). In 2017, INTESOL produced a white paper titled *English Language Learner (ELL) Preparation for Indiana School Educators: A White Paper* in which they proposed that all pre-service teachers complete a basic research-based ESL methods class as a K-12 licensing requirement in Indiana (INTESOL, 2017, p. 4).

Conclusion

The purpose of this study was to address the use of mind-mapping as a classroom

strategy for identifying and assessing the knowledge base of pre-service teachers as they prepare to work with ELs in mainstream classrooms. Analysis of the mind maps revealed that pre-service teachers grew in ways that developed their knowledge of 1) supporting ELs through specific classroom strategies, 2) building awareness of and appreciating cultural diversity, 3) approaching language learning with an asset-oriented mindset, and 4) gaining a basic understanding of second language acquisition. This information was then used to modify curriculum and supports for pre-service teachers who are learning to work with ELs in mainstream classrooms.

Moving forward, teacher educators who are looking to include more preparation in working with ELs into their programs may use mind maps as a starting point to measure what pre-service teachers already know as well as what they find memorable after participating in an experience with ELs. As with this study, the information gleaned from mind maps could help teacher educators evaluate pre-service teacher learning, adjust the curriculum and experiences in their programs, and advocate for a stand-alone course or more contact hours working with ELs in their preparation programs.

Future research may seek to repeat this research across multiple cohorts of pre-service teachers to see if and how similar themes emerge. Other next steps could include asking participants to complete a third mind map after they have been teaching for several years to see what knowledge is retained or expanded upon and how that varies depending on whether they work in a school with a high EL population or not. Ultimately using mind maps in teacher preparation of pre-service teachers to work with ELs can provide insight into what pre-service teachers are retaining from their experiences and provide teacher educators with data to make informed decisions and changes in curriculum.

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