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Self-Regulated Multimedia Cognitive Learning Model: Enhancing Vocabulary Acquisition in Adult English Learners

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Abstract
This mixed method study examined the effects that a Self-Regulated Multimedia Cognitive Learning Model, infused with internationally acclaimed effective instructional vocabulary strategies, had on the vocabulary acquisition skills of adult English Learners enrolled in a college course. Outcome measures included vocabulary pretests and posttests, surveys, and participant interviews. Quantitative data were analyzed using descriptive statistics and paired samples t-tests whereas qualitative data was analyzed using open, axial, and selective coding. Findings were statistically significant across all six vocabulary tests, with large effect sizes. Overall, adult English Learners perceived the vocabulary instruction using a Self-Regulated Multimedia Cognitive Learning Model to be beneficial to their vocabulary learning and useful for generalization purposes outside of the classroom. Future research and implications for practice are also offered for the use of the Self-Regulated Multimedia Cognitive Learning Model to improve second language learning and the college success rates of English Learners in the United States.

1 Background Information

Internationally, it has become common practice for millions of people to learn a second language (Blair & Morini, 2023), with approximately 1.5 billion people worldwide actively pursuing the acquisition of a foreign language (LingoMelo, 2023). Multilingual education may provide access to global job opportunities, allowing multilingual people to earn up to 20% more than monolingual people (LingoMelo,

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2023). Despite the advantages of multilingual education, the lack of second language learning mandates in the United States (U.S.) causes them to lag behind other nations in foreign language intelligence (Mykhalevych, 2023). As the U.S. continues to become more diverse, the need to navigate and leverage multilingualism in the workplace grows (Bergey et al., 2018).

International students in U.S. higher education are rising, with an 8% growth rate for the 2023-2024 academic year as they prepare for the workforce (Baer & Martel, 2023). The rise in international students enrolling in U.S. institutions of higher education (IHE), alongside an estimated 22% of individuals aged five and older speaking a language other than English (U.S. Census Bureau, 2022), contributes to a diverse population that can harness the benefits of multilingualism for the workforce and economy. English Learners (ELs) and multilingual learners are in a good position to help the U.S. meet the diverse workforce demands (Bergey et al., 2018). However, approximately 8% of the U.S. population (five years or older) reported that they spoke English less than very well (U.S. Census Bureau, 2022); data that the U.S. government uses in determining the need for language-assisted services and the allocation of educational funds to help students learn English (Dietrich & Hernandez, 2022). The allocation of funds to support language learning initiatives at U.S. IHEs may help instructors better contend with the linguistically diverse classrooms they face, as it is critical to properly support English language learning to improve the college success rates of this diverse student population (Bergey et al., 2018; Izatullah et al., 2022).

1.1 Boosting the college success rates of ELs

Community colleges often attract international students who want to improve their English, and conditional acceptance policies exist at many four-year universities for ELs who do not have the required levels of English proficiency (Bergey et al., 2018). Although there has been invaluable work to support ELs by many U.S. IHEs that offer English language learning classes and other targeted language learning supports, there is more work to do to improve the college success rates of ELs (Bergey et al., 2018). ELs have been accessing colleges and graduating from college at far lower rates than their non-EL peers (Kanno & Cromley, 2013; Núñez et al., 2016). According to proficiency exam results, knowledge of the English language was a significant predictor of success in university classrooms where English is the medium of instruction (Rose et al., 2020). Language proficiency and academic performance of undergraduate students were strongly positively correlated (Izatullah et al., 2022). Núñez et al. (2016) emphasized:

> the importance of recognizing EL students in higher education as potentially marginalized students with distinctive experiences and needs, even though their identities can also overlap with those of other marginalized student groups that have received more attention in higher education research. (p. 81)

Intentional language support for ELs is a step in the right direction toward boosting their chances of succeeding in college (Rose et al., 2020).

1.2 A focus on vocabulary acquisition

Second language learners identify vocabulary acquisition as one of the most crucial components of second language learning (Blair & Morini, 2023). Vocabulary acquisition is also the most frequent and pervasive barrier to learning another language (Vidal Jr., 2021). In their attempt to urge educators to ramp up their targeted vocabulary support to ELs, Brooks et al. (2021) underscored the importance that vocabulary word knowledge has on reading comprehension; an essential skill for the college success of ELs. According to Samaraweera (2023), vocabulary acquisition makes it possible to proficiently construct the meaning of second language acquisition. Without adequate vocabulary knowledge,

receiving and producing the meaning of the target language is difficult (Samaraweera), thus Vidal Jr.'s (2021) recommendation to focus on utilizing explicit and intentional vocabulary learning strategies to boost vocabulary acquisition and second language (L2) acquisition overall. Furthermore, adult ELs reported having positive attitudes and beliefs towards vocabulary learning (Vidal Jr.), making them ideal candidates motivated to acquire English vocabulary.

Although both child and adult L2 learners experience barriers with vocabulary acquisition (Blair & Morini, 2023), adult language learners typically do not reach as high of language proficiency levels as child language learners (DeKeyser, 2013; Monner et al., 2013). Brooks et al. (2021) encouraged educators to ramp up their targeted vocabulary supports, as acquiring L2 vocabulary is a complex process (Huang & Chou, 2024) and adult language learners tend to experience more challenges with vocabulary acquisition than child language learners (Blair & Morini, 2023).

1.3 ELs in the U.S. can benefit from global vocabulary strategies

Ortogero and Ray (2021) conducted a systematic literature review that drew upon effective vocabulary acquisition strategies for ELs from countries outside of the U.S. They encouraged educators in the U.S. to adopt these vocabulary acquisition strategies as a bundle with the underpinning of self-regulation and cognitive learning models to help ELs more effectively expand their English vocabulary. The effective vocabulary acquisition strategies gleaned from other countries included (1) using the first language (L1) to teach the L2, (2) integrating the target language into the content taught, (3) incorporating cultural relevance in both the L1 and L2, (4) use of explicit multimodal word learning strategies, (5) use of multimedia, and (6) promoting self-regulation (Ortogero & Ray). By embedding these six vocabulary acquisition strategies found in their systematic literature review into Mayer's (2014) Cognitive Theory for Multimedia Learning and a self-regulated model of learning (Pintrich, 2000), they coined the "Self-Regulated Multimedia Cognitive Learning Model" (SRMCLM) to help ELs effectively acquire English vocabulary. Although the SRMCLM was intended for ELs in Kindergarten through twelfth grade, several studies (Alyami & Mohsen, 2019; Lee & Macaro, 2013; Teng, 2023; Webb, 2007) show how similar vocabulary acquisition strategies can positively impact adult ELs.

1.3.1 The power of cultural relevance

Using the native language to teach the L2 is associated with culturally relevant teaching practices (Ortogero & Ray, 2021), and connections made between L1 and L2 enhance vocabulary learning of both adult and child ELs (Lee & Macaro, 2013). However, Kroll and Stewart (1994) suggested that early L2 learners benefit more from using their native language in learning the second language than intermediate to highly proficient L2 learners, as increased L2 proficiency leads to reduced reliance on L1 equivalents. A critical goal of vocabulary acquisition should be to retain the information in our long-term memories for accessible retrieval as needed (Ge, 2015). For nonproficient or low-level ELs, too many vocabulary words in the target language can be overwhelming and discouraging; therefore, using their L1 can help them to understand vocabulary words in L2 (Ge, 2015). Studies showed that when teachers alternate between the adult learner's L1 and L2 during instruction, it leads to greater academic vocabulary acquisition in the L2 compared to an L2-only teaching approach (Blair & Morini, 2023; Lee & Levine, 2020).

It is important to consider using L2 as well as L1 culture (Vidal Jr., 2021). In a study by Zitouni et al. (2021), adult ELs identified learning about the culture of the target language (English) as one of the most frequently used strategies for acquiring new vocabulary. Learning a new L2 vocabulary word triggers the transfer of the image of the word from L1, and the concepts from both languages are often not the equivalent, in which "case, they [the L2 learner] should not confine themselves to translating that word [from L2 to L1] but integrate it into the L2 cultural environment" (Vidal Jr., 2021, p. 85).

1.3.2 Exposure to target language reading

Access to a successful college education for ELs can hinge upon comprehending what is read in the target language (Brooks et al., 2021). Exposure to readings in the target language is an effective way to boost vocabulary acquisition in the L2 (Alyami & Mohsen, 2019). Reading is a language-based process. Through reading, learners can understand how words behave in a language and how they are used to generate meaning in written discourse. In the reading process, the readers may understand linguistic information encoded by the writer, helping the readers acquire vocabulary knowledge from context (Samaraweera, 2023).

Adult ELs boosted vocabulary learning in both breadth (e.g., number of words) and depth (e.g., word collocation) when provided with the opportunity to access written texts in the target language, also known as meaning-focused reading (Samaraweera, 2023). In a study by Webb (2007), repetitive exposure to unknown English vocabulary words through reading significantly enhanced vocabulary knowledge in adult ELs compared to those who encountered the words less frequently. Exposure to unknown English words 10 times in context produced sizeable gains in vocabulary knowledge for adult ELs (Webb, 2007). Reading written texts on various content may help adult ELs acquire content knowledge while simultaneously improving their English vocabulary. This approach aligns with the Content and Language Integrated Learning vocabulary acquisition strategy found in Ortogero and Ray's (2021) SRMCLM.

1.3.3 Explicit word learning strategies to increase vocabulary acquisition

Adult ELs shared that their teachers did not use vocabulary learning strategies while teaching them English and that their vocabulary learning experience would have been improved had their teachers taught them explicit word learning strategies (Zitouni et al., 2021). The participants' perceptions in Zitouni et al.'s study are supported by Alyami and Mohsen's study (2019), which found that explicit word learning strategies involving context clues and speech parts help adult ELs learn twice as many new English words compared to those who did not receive the explicit word teaching approach.

1.3.4 Incorporating multimedia & the cognitive learning model into the vocabulary acquisition

process for adult ELs

Multimedia can be embedded into any of the aforementioned vocabulary acquisition strategies found to be effective for adult ELs. Li and Deng (2018) demonstrated that integrating multimedia features such as texting with vocabulary acquisition strategies, alongside engaging course content and explicit word-learning techniques delivered through a multimedia platform, can enhance students' vocabulary skills. Li and Deng found that the frequency of texts read by adult ELs was positively correlated to vocabulary learning, also serving as a predictor of their vocabulary learning outcomes. Additionally, adult ELs improved their reading in a face-to-face university course through internet-based reading activities (Habbash, 2021). Engaging with the multimodal features of technology, such as adding definitions, word information, and videos, may further enhance the vocabulary acquisition skills of adult ELs (Teng, 2023).

The above findings reflect Mayer's (2014) Multimedia Cognitive Learning Theory, emphasizing the cognitive processes of learning when developing multimedia materials to enhance learning results. It embeds multimedia (e.g., images, audio, text) to retain what is learned through an active learning process. Corresponding words and images are used simultaneously to construct mental representations of the material presented. Mayer's Multimedia Cognitive Learning Theory focused on retention, which Ge (2015) identified as a critical stage in the vocabulary acquisition process. The two stages of vocabulary acquisition are understanding a word's meaning and retaining it. Since the retention stage is often more challenging (Ge, 2015), Mayer's Multimedia Cognitive Learning Theory should be considered

when teaching English vocabulary to adult ELs. Furthermore, in a study conducted by Khojah and Thomas (2021), ELs who received multimedia instructional tasks were more motivated and did better academically when compared to the control group. Multimedia appears to increase motivation, an aspect of self-regulation.

1.3.5 Promoting the self-regulation of adult ELs

Adult ELs rated as highly willing to communicate outperformed adult ELs rated as having a low will to communicate on a productive vocabulary test (Heidari, 2019). Highly willing to communicate meant ELs reported being motivated, having a positive attitude, and being willing to take risks while learning the language (Heidari, 2019). If motivation, which is foundational to Pintrich's (2000) Self-Regulated Learning Model, is potentially connected to improved vocabulary performance (Heidari, 2019) and other vocabulary associated tasks such as writing (Graham et al., 2021), then it is a noteworthy consideration when teaching vocabulary to adult ELs. Pintrich's (2000) Self-Regulated Learning Model outlines four key phases: (1) forethought, planning, and activation; (2) monitoring; (3) control; and (4) reaction and reflection. These phases provide a framework for incorporating effective vocabulary acquisition strategies for adult ELs, emphasizing proactive planning, ongoing monitoring, self-control, and reflective practices throughout the vocabulary acquisition process.

The study conducted by Zitouni et al. (2021) aligns with Pintrich's (2000) Self-Regulated Learning Model, particularly in the phases of monitoring and planning. It illustrated that adult ELs frequently use metacognitive strategies, such as monitoring their progress and planning their learning approach when acquiring new vocabulary. This finding further underscores the importance of incorporating metacognitive strategies into vocabulary instruction for adult ELs, as emphasized in Pintrich's model, to enhance their self-regulated learning and improve word acquisition outcomes.

2 Purposes and Research Questions

Vocabulary acquisition plays a crucial role in L2 acquisition (Blair & Morini, 2023; Vidal Jr., 2021) for adult ELs; therefore, offering intentional vocabulary acquisition support for ELs is both a positive and imperative step toward enhancing their likelihood of success in college (Izatullah et al., 2022). While numerous studies demonstrate effective vocabulary acquisition strategies for both adult and children ELs, there is limited research on how self-regulation strategies are embedded with these strategies. Ortogero and Ray's (2021) proposed SRMCLM addresses this gap by investigating its impact on the vocabulary acquisition skills of children ELs. The present study explores how Ortogero and Ray's effective vocabulary acquisition strategies, originally intended for Kindergarten through twelfth-grade children, can be applied to adult ELs.

This study aims to answer the following research questions:

(1) What effect did the SRMCLM have on the vocabulary acquisition skills of adult ELs as they learned the unit *Wonder*?

(2) What are the perceptions of adult ELs about the SRMCLM in helping them to learn English vocabulary words while studying the book *Wonder*?

3 Methodology

3.1 Setting

This study took place at a local community college on an island in the Pacific. The setting was an English as a second language reading and writing course designed to help intermediate-level non-native English speakers develop their study skills and enhance their English skills in reading comprehension, reading

fluency, writing, and vocabulary. The course instructor had a Master's degree in Second Language Studies. Students in the course attended class face-to-face twice weekly from 10:30 a.m. to 1:15 p.m. throughout the fall semester. The first author collaborated with the course instructor to come once a week for 75-minute sessions throughout the fall semester to provide SRMCLM vocabulary instruction.

3.2 Participants

Nine participants consented to participate in this study. All nine participants were selected purposefully because they were adults who were non-native English speakers learning English as students enrolled in an English as a second language reading and writing course at a local community college. Seven of the participants were female and two were male. Four of the participants' native language was Japanese, with the other five participants' native languages being Turkish, Chinese, Vietnamese, Filipino, and Spanish.

3.3 Measures

3.3.1 Vocabulary multiple-choice quizzes

There were six multiple-choice vocabulary quizzes. Each quiz consisted of 12 questions. Each question presented the vocabulary word, including its word usage in a sentence from the novel *Wonder*, and offered four choices of definitions. The directions asked participants to select the answer that accurately defined each word used in the provided sentence. Each question was scored as correct or incorrect and then calculated for percentage correct.

3.3.2 Vocabulary paragraph writing

After completing each multiple-choice vocabulary quiz, participants were directed to, "Write a one-paragraph story using a minimum of 5 of the vocabulary words you were just tested on in numbers 1 through 12. For your reference, here are the vocabulary words you can select from to write your one-paragraph story." Participants received one point for each vocabulary word used correctly within the context of their story. No points were taken off for grammatical errors. They could earn up to 12 points for each paragraph based on the use of the 12 vocabulary words from the multiple-choice quiz.

3.3.3 Social validity survey

At the end of the instruction, participants completed a social validity survey. The survey included 11 Likert-scale questions on a 1 to 4 scale with 1 being strongly disagree and 4 being strongly agree. The questions asked if the instruction was easy to understand, useful, interesting, and helpful. Additionally, the survey asked if they learned something from the instruction, would recommend the instruction to other students, if the instruction was relevant for college students, if they could use what they learned in other classes, and if the instruction helped them improve their vocabulary skills. Participants were also asked to provide responses to two short-answer questions, Why did you rate the statement, "The vocabulary instruction helped me improve my vocabulary skills," the way you did? And What else do you think we should know or do you want to share about the vocabulary instruction? See Appendix A for the survey questions.

3.3.4 Social validity interview

At the conclusion of instruction, participants also participated in semi-structured interviews. Participants were asked 10 questions about their perceptions of the intervention (e.g., How did using your L1 help you learn the English vocabulary words in the unit *Wonder*?, How did goal setting and self-monitoring help you learn the vocabulary words in the unit *Wonder*?). See Appendix B for the interview questions.

3.4 Vocabulary instruction using the SRMCLM

The intervention used with the adult EL participants in this study is Ortogero and Ray's (2021) proposed SRMCLM which leverages a Multimedia Cognitive Learning Theory (Mayer, 2014) and a Self-Regulated Learning Model (Pintrich, 2000) to implement six vocabulary acquisition strategies found to be effective with Kindergarten through twelfth-grade students in countries outside the U.S. These effective vocabulary acquisition strategies include using L1 to teach L2, Content and Language Integrated Learning, cultural relevance in both L1 and L2, explicit word learning strategies, multimedia use, and self-regulation. To emulate Ortogero and Ray's (2021) SRMCLM, the following steps were implemented to incorporate all six effective vocabulary acquisition strategies, utilizing instructional approaches based on the Multimedia Cognitive Learning Model (Mayer, 2014) and a Self-Regulated Learning Model (Pintrich, 2000).

First, the forethought and planning phase of Pintrich's (2000) Self-Regulated Learning Model was implemented to help the participants set a vocabulary acquisition goal of identifying the correct meaning of 10 out of 12 words or phrases (selected by course instructor from the novel *Wonder*) on each vocabulary quiz. As part of this first step, the vocabulary words targeted for learning were pre-taught to participants using explicit word learning strategies (i.e., providing examples and non-examples of vocabulary definitions). This was done through a multimedia presentation (i.e., Google slide, digital images to represent examples and non-examples of written definitions), all grounded in Mayer's (2014) Multimedia Cognitive Learning Model.

The second step involved implementing the Content and Language Integrated Learning strategy where participants were provided with an example of how the vocabulary words were used in sentences from the novel *Wonder* that they were studying; presenting this to participants using multimedia helped activate their sensory memory. They received vocabulary words in written sentences from the novel *Wonder,* accompanied by representative images, animations, or video. Part of this second step included participants self-monitoring their present levels of knowledge with vocabulary words using multimedia (digital Jamboard progress monitoring graph), and then using their data to guide their own instruction on how to meet the vocabulary acquisition goals.

Third, participants were provided with culturally relevant learning activities on a digital platform in both L1 and L2. An example of how the vocabulary word was used in an L2 culturally relevant sentence paired with a digital image or animation to represent what is happening in the picture was followed by the participants providing and sharing their own culturally relevant examples on the digital platform. This third step represents the element of Mayer's (2014) Multimedia Cognitive Learning Model where verbal and pictorial representations from participants' working memory integrate into the long-term memory from prior knowledge. Additionally, this third step encompassed the self-monitoring and self-reflection stages of Pintrich's (2000) Self-Regulated Learning Model. Participants digitally monitored and graphed their vocabulary acquisition progress, reflecting on how they could adjust their study habits to improve their chances of achieving the vocabulary acquisition goals.

The fourth step involves using participants' first language (L1) to teach English. This occurs through classroom discussions and multimedia, where participants are presented with a digital image or animation that illustrates the vocabulary word's meaning, accompanied by a written discussion prompt. Participants were also shown, next to the discussion prompt, the English vocabulary words translated into their L1. They engaged in an activity where they would turn to a partner and respond to the prompt about the meaning of the vocabulary word in L1 and then translate the response into English, followed by a whole class discussion about the answer to the prompt in English. The verbal and pictorial components involved in this fourth step also represented Mayer's Multimedia Cognitive Learning Model as the digital images and verbal discussions paired with prior L1 knowledge helped transfer the meaning of the vocabulary words from the working memory to the long-term memory. Lastly, participants engaged in self-regulation by self-reflecting on their charted progress monitoring data to adapt and set new learning

goals for maintenance and generalization purposes. See Table 1 for Proof of Concept: SRMCLM Implementation.

Table 1

Proof of Concept: Self-Regulated Multimedia Cognitive Learning Model Implementation

Step	Effective Vocabulary Acquisition Strategies	Self-Regulation Learning Theory	Multimedia Cognitive Learning Theory
1	Pre-teach vocabulary using explicit word learning strategies (i.e., explicit instruction that includes examples and non-examples of the vocabulary definitions).	Forethought and planning (i.e., my goal is to learn the definitions of the vocabulary words or phrases from the novel *Wonder* and use the vocabulary words/phrases in my writing). I can identify the correct meaning of 10 out of 12 words/phrases on a vocabulary quiz.	Multimedia presentation (i.e., Google slide with digital images of examples and non-examples of vocabulary definitions, present digital Jamboard progress monitoring graph with the goal).
2	Content and Language Integrated Learning (i.e., provide an example sentence of how the vocabulary word is used from the *Wonder* novel).	Self-monitor and control (i.e., record present level of performance to gain awareness of where one stands about knowing what the vocabulary word means). Self-instruct (i.e., evaluate and analyze progress on present levels of performance and instruct self on how to achieve vocabulary goal).	Sensory memory (i.e., vocabulary words in written sentences paired with representative images, animations, or video). Digital self-monitoring graph.
3	Design culturally relevant learning activities in the first and second languages (i.e., participants think of, write, post a picture, and discuss a situation where the vocabulary word relates to them/their lives after seeing an example from instructor).	Self-monitor (i.e., record progress to gain awareness of where one stands about knowing what the vocabulary word means). Self-reflect (i.e., evaluate and analyze progress and make decisions about adapting learning strategies or study habits).	Working memory from verbal and pictorial representations integrated with long-term memory from prior knowledge (i.e., Jamboard post of vocabulary word used in a relevant written and verbalized sentence with a digital image or animation representing what is happening in the sentence). Digital self-monitoring graph.

| 4 | Use the first languag to teach English through classroom interactions/discussions (i.e., show English vocabulary words translated into the first language, then turn to a partner and respond to a written and pictorial prompt about the meaning of the vocabulary word in the first languag and then translate the response into English; followed by whole class discussion in English regarding answer to prompt). | Self-reflect, evaluate, and adapt to set new goals (i.e., analyze progress and make decisions about adapting learning strategies for new goals). Maintenance and generalization (i.e., using the words in sentences, using what they learned in other classes/ contexts). | Working memory from verbal and pictorial representations integrated with long-term memory from prior knowledge (i.e., Digital picture or animation shown of vocabulary word meaning with written and verbal discussion prompt). |

3.5 Fidelity and quality of implementation

Fidelity of implementation was evaluated using a checklist of the core intervention components including self-monitoring vocabulary acquisition, teaching using multimodal explicit word learning strategies, Content and Language Integrated Learning use, multimedia use, and employing culturally relevant teaching practices. Quality of instruction was evaluated using a checklist that assessed the instructor's preparedness, thoughtfulness when implementing instruction, enthusiasm, rate of instructional delivery, and students' engagement and responsiveness. The observer assessed fidelity of implementation and quality of instruction for 33% of the lessons. The instructor (first author) implemented the instruction with a score of 100% for both fidelity and quality across all observed lessons.

3.6 Design and analysis

In this explanatory sequential mixed method study, nine non-native English speakers enrolled in an English as a second language reading and writing course at a local community college received vocabulary instruction to support their learning of English. To examine the effects and students' perceptions of the vocabulary instruction, quantitative and qualitative data were collected. Quantitative data was first collected, followed by qualitative data to further explore vocabulary acquisition instruction (Creswell & Clark, 2018). Quantitative data was analyzed using descriptive statistics and paired samples t-tests. Effect size was calculated using Hedge's *g* to account for the small sample size with an interpretation of 0.20 being a small effect, 0.50 being a medium effect, and .80 and higher a large effect. Qualitative data was analyzed using open, axial, and selective coding (Williams & Moser, 2019).

4 Findings

4.1 Research question 1: Did SRMCLM instruction improve adult ELs vocabulary acquisition?

4.1.1 Multiple-choice vocabulary quizzes

Overall, the instruction positively impacted participants' abilities to identify correct definitions of vocabulary words on multiple-choice quizzes. Participants made statistically significant improvements on all six multiple-choice quizzes and their summative vocabulary quiz scores (all *p*-values < .001; see

Table 2 for means and standard deviations). Before receiving SRMCLM vocabulary instruction, the majority of participants were able to correctly identify the definition of only a few words on the quiz (range 1 - 11). After instruction, participants increased their average vocabulary definition scores from 6.48 to 10.41.

4.1.2 Paragraph writing using vocabulary words

The instruction also had a positive effect on participants' ability to correctly utilize the vocabulary words when writing a paragraph. Participants made statistically significant gains on all six paragraph writing quizzes and their summative paragraph writing score with Quiz 1 $p = .009$, Quiz 2 $p < .001$, Quiz 3 $p < .001$, Quiz 4 $p = .005$, Quiz 5 $p < .001$, Quiz 6 $p = .003$, Summative Quiz $p < .001$ (See Table 2 for means, standard deviations, and effect size). Before instruction, the majority of participants accurately incorporated one vocabulary word when writing a paragraph. After instruction, participants' vocabulary use within their writing improved from an average of 0.76 to 5.07 vocabulary words within their paragraphs. Additionally, although the directions for the paragraph writing stated to use a minimum of five vocabulary words, many participants incorporated more than the minimum required.

Table 2

Means and Standard Deviations of Vocabulary Quizzes

Test	Multiple Choice			Paragraph Writing		
	Pre-test	Post-test	g	Pre-test	Post-test	g
Quiz 1	6.71 (2.69)	10.00 (1.91)	2.28*	1.43 (1.62)	5.29 (3.20)	1.07*
Quiz 2	5.78 (2.28)	9.67 (3.08)	1.37*	1.11 (1.27)	5.33 (2.34)	1.92*
Quiz 3	5.44 (2.19)	10.56 (1.33)	2.52*	0.78 (1.72)	4.78 (1.98)	1.58*
Quiz 4	6.38 (1.51)	10.25 (2.5)	1.90*	0.88 (1.46)	5.00 (3.07)	1.09*
Quiz 5	7.75 (2.12)	11.75 (0.71)	1.66*	0.25 (0.46)	6.25 (1.83)	2.49*
Quiz 6	6.89 (2.37)	10.33 (1.94)	2.33*	0.78 (1.09)	4.22 (2.68)	1.11*
Summative Quiz	6.48 (1.72)	10.41 (1.60)	4.36*	0.76 (0.67)	5.07 (1.89)	2.06*

Note. Standard deviation in parentheses. Paired-samples one-tailed t-test. *p < .05.

4.2 Research question 2: What are the perceptions of adult ELs about the SRMCLM instruction in helping them to learn English vocabulary words?

Two overall themes resulted from the participant social validity interviews. The beneficial and effective aspects of the instruction and suggestions for improvement.

4.2.1 Beneficial and effective aspects of the instruction

Participants reported many benefits after receiving instruction resulting in "deep" understanding of taught vocabulary words. Sub-themes included improved comprehension, direct instruction, usage of L1 to learn L2, culturally relevant activities through multimedia, goal setting, class discussions, and generalization.

4.2.2 Improved comprehension

Participants reported improving their acquisition of the English vocabulary words while simultaneously improving comprehension of the novel, *Wonder,* suggesting the importance of Content and Language Integrated Learning through the SRMCLM vocabulary labs. All participants referenced how the vocabulary labs improved their reading comprehension. One participant stated, "I read *Wonder* [*sic*]

sometimes I learned the exact words and ohh [*sic*] I remember this word because last week we learned this." Another participant said, "The book sometime [*sic*] I don't understand. When I complete, maybe the example. Yes I can. I can understand."

4.2.3 Direct instruction

Another common response was that direct instruction provided by a native English speaker deepened understanding of word meanings. Participants (*n* = 7) mentioned examples of instruction that assisted their learning including examples, non-examples, and elaboration on contexts to use the newly taught words. One participant responded: "Your class was very useful how [*sic*] to use it so yeah and how to remember because you show me image [*sic*] about the vocabulary… [*sic*] then you explain how to use it." Another participant appreciated the direct instruction stating, "...like some of the words I know already. But sometimes I forget the meaning. So it's kind of like really cool, like having vocabulary words." Similarly, another participant explained how the instruction made it easier because "you explain how to use it…And then I learn."

4.2.4 Using L1 to learn L2

Participants (*n* = 6) also found using their L1 to learn the L2 assisted in their understanding of taught words. Specifically mentioned tools included online dictionaries and translators embedded into the lab slides that assisted participants with the translation of the English word to their L1. This was highlighted by a participant stating, "If I don't know the mean [*sic*] …you explain. When you teach me these words in Japanese first and then I listen…you keep talking about this word and then more understand [*sic*]." Another stated that the translator embedded in the slides was "helpful for me like having dictionary especially [*sic*] in vocabulary words."

4.2.5 Culturally relevant multimedia activities

Next, the culturally relevant activities embedded into the multimedia lessons were beneficial, including the relevant examples using pictures on Google slides and Jamboard activities. Eight participants referenced how the use of pictures or videos and nonexamples paired with text deepened understanding of the words resulting in better retention of word meaning. "Non example and example is [*sic*] really helpful cause [*sic*] you will see from my point of view I see like [*sic*] this is the synonym and antonym." Participants (*n* = 7) also discussed how examples with pictures or synonyms helped them make connections and relate the word to themselves or their peers. A participant stated, "It's difficult to imagine so with picture [*sic*] it is easy to imagine…understand." Another participant said, "I think every time you learn vocabulary you need picture [*sic*] so you can remember."

Additionally, others mentioned how the multimedia serves as a study tool they can refer to when studying the new vocabulary words. A participant expressed how they felt they "learn more" because they continue "reading book [sic] and then check vocabulary" on the slides.

4.2.6 Goal setting

Eight participants reported that the goal-setting aspects of the instruction contributed to their understanding of the new vocabulary words. Particularly, participants used their strategies of graphing their pre and post-test results to increase their motivation for improvement and adjust their study habits. One participant responded, "The goal is very helpful for me cause [*sic*] I know if I can get 10 and above I studied." Another stated that their growth resulted in them being able to "improve, make [*sic*] me happy." An example of increased motivation was one participant stating, "Yeah, you gotta practice with your friends" to meet goals.

4.2.7 Class discussions

Five participants mentioned how class discussions with the instructor and immediate feedback from the instructor and peers helped them to comprehend the English vocabulary words. In addition to improving participants' vocabulary and assisting with using the new words in various contexts, these discussions improved participants' grammar as well as increased camaraderie and trust amongst the group, with one participant stating they felt, "trust from everybody there." Another said how the discussions improved clarity, "we learn how to listening [*sic*] well too....I confused [*sic*] but [the discussions] help you so it's so helpful for that." One participant shared how they were glad they were not just left to memorize the words on their own as that would be boring; further expressing how learning about others' experiences with the vocabulary words as well as exploring one's own through discussion helped them to better learn the words.

4.2.8 Generalization

Additionally, the theme of generalizing vocabulary usage emerged across all the interview questions. Participants discussed using the taught vocabulary words outside of the classroom during conversations with family, friends, and coworkers as well as when reading other books and watching movies. One participant shared how they could use the words in conversations with their spouse. Another participant noted how the instruction was "helpful…in job, workplace [*sic*]…I remember." Another said, "...helped you understand not only what's going on in *Wonder* but other books." A specific taught vocabulary word example was provided when one participant stated how they recognized a taught word, ordinary, in a conversation, "Yesterday my friend told me that [*sic*] how was your day? What about your day?...Oh my friend, just ordinary [*sic*] day." Lastly, one participant shared how the instruction from these lessons built their independence for future English vocabulary use and learning.

4.2.9 Suggestions for improvement

While participants generally reported favorable benefits of and attitudes toward the instruction, some suggestions for improvement were mentioned. The most common response was regarding increasing the dosage of the intervention. Participants expressed interest in increasing the amount of time spent on learning the vocabulary words in addition to increasing the number of words learned. The SRMCLM vocabulary labs ran for approximately 75 minutes weekly for 4 months and targeted learning 72 words total. Participants reported that they would benefit from more opportunities to practice the new vocabulary words during class discussions and read-alouds of the novel as it increased their confidence in using the words. One participant stated, "I want to stay more…I want to conversation [*sic*] using vocabulary more."

While many participants enjoyed using their L1 to learn the English vocabulary, a few critiqued this strategy with some participants suggesting spending less time on instruction using participants' L1. Some participants reported that time in their L1 distracted them from focusing on learning the L2. Another concern was the use of the translator with a participant stating, "Translator [*sic*] was not always accurate." One participant stated, "I think sometimes when you put in the Google translator, sometimes in their own language is [*sic*] different what they heard or what they learn. So sometimes oh this is wrong…" Or, the translator would not produce the correct dialect (e.g., simplified versus traditional Chinese).

4.3 Social validity survey

The participants completed a social validity survey at the end of the semester once all instruction and post-assessments were finished. The survey consisted of two open-ended questions and 11 Likert

scale questions that ranged from 1 to 4, with 1 being strongly disagree and 4 being strongly agree. The participants reported that the vocabulary instruction was easy to understand ($M = 4$), useful ($M = 4$), interesting ($M = 4$), and helpful ($M = 4$). They also shared that they learned something from the vocabulary instruction ($M = 4$), that the instruction was relevant or meaningful ($M = 4$), and that they would recommend the instruction to a friend ($M = 4$). Further, participants reported that the vocabulary words taught were relevant or meaningful ($M = 3.88$) and that they could use what they learned from the instruction in other classes ($M = 3.88$). Finally, participants shared that the vocabulary instruction helped them improve their vocabulary skills ($M = 4$).

The first open-ended question asked participants to explain their reasons for their rating in the Likert scale question: The vocabulary instruction helped me improve my vocabulary skills. Participants wrote about the pedagogical methods being useful. Students wrote how the instruction helped them expand their vocabulary with a participant writing, "I can use my new words in my conversation with any person or add my idea when I meet new [*sic*] person." The second open-ended question asked participants to write anything else they wanted to share about the vocabulary instruction. The majority of participants responded with comments of gratitude for the instruction and stated that there was nothing they would change. Two participants commented on reviewing the words in native languages. With one participant sharing, "It's fun to learn words from other countries in English." Conversely, another student felt it was not an effective use of time to identify the vocabulary words in the L1 of all the students within the class. Finally, one student shared that they felt it was productive to use the words when writing paragraphs and that they liked the presentation of the lessons.

5 Discussion and Conclusion

Participants performed significantly better from the pretest to the posttest across all vocabulary quizzes; demonstrating that after receiving SRMCLM instruction they increased their understanding of English vocabulary and how to accurately use the words in the right context when writing paragraphs. In addition to improved performance, participants' perceptions were favorable towards the SRMCLM. Participants overall found all six of the vocabulary acquisition strategies outlined in Ortogero and Ray's (2021) study to be beneficial in building their English vocabulary. Participants also found SRMCLM to be highly useful in helping them learn English. These results indicate that Ortogero and Ray's (2021) SRMCLM originally intended for young ELs can also be effective for adult ELs.

Participants mentioned the power of culturally relevant examples and non-examples in improving their understanding of English vocabulary. The instructor modeled examples and non-examples of the vocabulary words in a way that was culturally relevant in the target language. To extend the relevance beyond the target language culture, participants also provided examples of the vocabulary relevant to their L1 culture. These findings are consistent with research about leveraging both the L1 and L2 cultures to improve English vocabulary (Ortogero & Ray, 2021; Vidal Jr., 2021; Zitouni et al., 2021).

Another aspect of cultural relevance is using the L1 to teach the L2 (Ortogero & Ray, 2021). Many participants perceived that using the L1 to teach L2 helped them to better understand English vocabulary, a vocabulary acquisition strategy supported by several scholars when working with child ELs (Lee & Macaro, 2013; Ortogero & Ray, 2021) and adult ELs (Blair & Morini, 2023). However, participants noted that the practice of using translators should be used with caution as there can be inaccuracies in translating English vocabulary words to the L1, particularly with contextual fluctuations in the word meanings. Some participants thought it beneficial to have access to online translation tools, yet many participants shared that leveraging the L1 through the translations provided by the instructor provided them more exposure to the word meanings, helping them to improve their understanding of the English words. Having the translations checked for accuracy ahead of time can maximize vocabulary instructional time and reduce the amount of time spent on finding the correct translation. Furthermore, teaching vocabulary should extend beyond translations as context matters (Ge, 2015).

Participants noted that discussing how words are used in context, paired with explicit word learning strategies (such as examples and non-examples) presented through multimedia, was an effective component of the SRMCLM; findings that support Li and Deng's (2018) research on how pairing explicit word learning techniques with multimedia is a predictor of positive vocabulary learning outcomes for ELs. Many participants shared that the added layer of receiving immediate feedback during discussion enhanced their understanding of the words while also benefiting their sentence development skills. They also shared that discussing various contexts the words could be used in, while simultaneously displaying videos or images and written text of word meanings helped them with word meaning recall and overall to gain a deeper understanding of the word meanings; a finding that is consistent with Mayer's (2014) Multimedia Cognitive Learning Model, as it depicts how pairing verbal with pictorial representations can lead to improved recall long-term. The quantitative results of this study suggest that pairing discussion with multimedia components may enhance the recall of vocabulary definitions and the ability to use words in the correct context when writing paragraphs. This is particularly relevant given that posttests were administered every 1 and a half weeks following vocabulary instruction. Furthermore, generalization was a primary theme that emerged regarding the benefits of SRMCLM, providing potential implications for how intentional discussions, multimedia, and explicit word learning strategies provide adult ELs with a deeper understanding of the vocabulary word meanings. These approaches appeared to foster the participants' ability to apply the vocabulary words to various contexts outside of the classroom, which some participants reported doing even months after receiving vocabulary instruction.

Participants also indicated that SRMCLM instruction helped them improve their understanding of the storyline in the novel they were studying. Integrating vocabulary learning with comprehending the content of the novel, *Wonder,* appeared to be beneficial to participants' vocabulary word learning and reading comprehension skills. Focusing on readings in the target language has been cited to improve the vocabulary acquisition skills of ELs (Alyami & Mohsen, 2019; Samaraweera, 2023; Webb, 2007). The findings of this study build upon Ortogero and Ray's (2021) research on Content and Language Integrated Learning as a successful strategy for vocabulary acquisition among young ELs. This study suggests that Content and Language Integrated Learning might also prove effective for adult ELs.

The results of this study also build upon Ortogero and Ray's (2021) review of self-regulation as an effective vocabulary acquisition strategy for child ELs, as adult ELs in this study also reaped benefits from self-monitoring and goal setting. Pintrich's (2000) Self-Regulated Learning Model appears to have beneficial outcomes for adult ELs' vocabulary acquisition skills as participants in this study found goal setting and self-monitoring highly motivating. As Heidari (2019) noted, motivation can be a considerable factor in achieving favorable vocabulary learning outcomes for ELs. Participants shared that the self-monitoring tool held them accountable and influenced them to adjust their study habits to improve their vocabulary learning.

5.1 Limitations and future research

There are several limitations that need to be mentioned. First, the study had a small sample size of nine participants. The generalizability of results was also limited because all students were in the same course at a community college and instruction was provided by the first author. Additionally, the study did not include a control group. Further, there were six different native languages represented by the participants which limited the amount of culturally relevant activities in both the L1 and L2 that were able to be incorporated within the instruction as part of the SRMCLM. Finally, the instruction was confined to vocabulary words within the novel, *Wonder*.

The limitations of this study suggest possible areas for future research. In future studies, it would be beneficial for instruction to be implemented by the course instructor. The effectiveness of the instruction could then be examined within a typical course setting and insights on the social validity of the

instruction from instructors could be obtained. This would be possible by providing course instructors with professional development on the SRMCLM and the instructional process. Future research should include a larger number of students with a control group to help reduce confounding variables and would increase internal validity. Finally, while this study examined the application of the SRMCLM with adult learners, the principles of the model are from literature that includes students from elementary school through adulthood. Thus, the application of the SRMCLM should be examined within the context of K-12 classrooms supporting the vocabulary development of ELs at various ages.

5.2 Implications for practice

The vocabulary labs benefitted students' comprehension of the novel and deepened their understanding of new English vocabulary words. Vocabulary labs using a multimedia format with culturally relevant activities and inclusion of participants' L1 is a viable option to increase students' knowledge of new English vocabulary words. There are considerations for practitioners when implementing such instruction in the future. Participants did report some of the translations were not always perfectly translated, emphasizing the need to include multiple exposures, activities, and discussion opportunities to build understanding. Participants also expressed that integrating the novel content with vocabulary learning was helpful for them to learn the vocabulary words while simultaneously comprehending the story. Embedding a co-teaching model between the course instructor and researcher while simultaneously instructing students on the novel and vocabulary components is a viable strategy for teaching these concepts in the future while also providing professional development to IHE instructors to develop and sustain effective vocabulary acquisition practices for adult ELs. Finally, the use of self-monitoring has the potential to motivate adult ELs to improve their vocabulary. Thus, instructors teaching adult ELs, should consider utilizing the SRMCLM to help enhance vocabulary acquisition.

Overall, the intentional vocabulary acquisition instruction cited by Ortogero and Ray (2021) as being effective with young ELs, can also be effective for adult ELs, as evidenced by the results of this study. Targeted international vocabulary acquisition strategies, such as those in SRMCLM, could contribute to offering deliberate language support aimed at enhancing the academic achievement of adult ELs in the U.S. Such initiatives not only have the potential to elevate college success rates for ELs in the U.S. (Rose et al., 2020) but also to open up global employment prospects for the U.S. workforce.

Appendix A

Social Validity Survey Questions

Likert-Scale Questions: 4-point scale from 1 (Strongly Disagree) to 4 (Strongly Agree)
1. The vocabulary instruction was easy to understand.
2. The vocabulary instruction was useful.
3. The vocabulary instruction was interesting.
4. The vocabulary instruction was helpful.
5. I learned something from the vocabulary instruction.
6. I would recommend the vocabulary instruction to other students.
7. The vocabulary instruction was relevant for college students.
9. The vocabulary words were relevant for college students.
10. I can use what I learned from the vocabulary instruction in other classes.
11. The vocabulary instruction helped me improve my vocabulary skills.

Short Answer Response Questions

12. Why did you rate the statement, "The vocabulary instruction helped me improve my vocabulary skills," the way you did?

13. What else do you think we should know or do you want to share about the vocabulary instruction?

Appendix B

Interview Questions

1. What did you find beneficial about the vocabulary lessons for the unit *Wonder*? Why?
2. How did the vocabulary instruction help you understand the novel *Wonder*?
3. How did using your first language help you learn the English vocabulary words in the unit *Wonder*?
4. How did culturally relevant activities (e.g., Jamboard, discussion) help you learn the vocabulary words in the unit *Wonder*?
5. How did goal setting and self-monitoring help you learn the vocabulary words in the unit *Wonder*?
6. How did multimedia (e.g., videos, text, animations, audio, pictures) help you to learn the vocabulary words in the unit *Wonder*?
7. What instructional strategies used by the researchers and/or course instructor were most effective in helping you to learn the vocabulary words in the unit *Wonder*?
8. What instructional strategies used by the researchers and/or course instructor were the least effective in helping you to learn the vocabulary words in the unit *Wonder*?
9. What components of the vocabulary lessons in the unit *Wonder* did you find the most enjoyable?
10. What advice or tips might you provide to the researchers and/or course instructor to help improve your vocabulary learning in the ESL 18 course?

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