

UC Riverside

UC Riverside Electronic Theses and Dissertations

Title

Dismantling Learning Barriers to Empower Underserved Older Adults: Cognitive, Functional, and Psychosocial Benefits of a Community-Based Learning Intervention

Permalink

<https://escholarship.org/uc/item/6t81h3d8>

ISBN

9798180113238

Author

Rodriguez, Tania Melissa

Publication Date

2026-05-09

Peer reviewed|Thesis/dissertation

UNIVERSITY OF CALIFORNIA
RIVERSIDE

Dismantling Learning Barriers to Empower Underserved Older Adults: Cognitive,
Functional, and Psychosocial Benefits of a Community-Based Learning Intervention

A Dissertation submitted in partial satisfaction
of the requirements for the degree of

Doctor of Philosophy

in

Psychology

by

Tania Melissa Rodriguez

June 2026

Dissertation Committee:

Dr. Rachel Wu, Chairperson

Dr. Diamond Bravo

Dr. Olivia Atherton

Copyright by
Tania Melissa Rodriguez
2026

The Dissertation of Tania Melissa Rodriguez is approved:

Committee Chairperson

University of California, Riverside

ACKNOWLEDGMENTS

My academic journey and the work presented in this dissertation would not have been possible without the support and encouragement of many people in my life. I am especially grateful to my mentor, Dr. Rachel Wu, for giving me the opportunity to work under her guidance. I feel incredibly fortunate to have had her mentorship, as she consistently provided me with opportunities to grow and advance in my academic career. She encouraged me to push myself further and gave me the trust and confidence to pursue not only the work described here, but also many other projects from which I learned so much. Her dedication, incredibly fast feedback, and strong leadership helped me refine my research and professional skills. Beyond her exceptional mentorship, I deeply appreciate how approachable, caring, and flexible she has been throughout our time working together. It is thanks to her that my PhD journey has been such a positive and rewarding experience.

I am also thankful for the many mentors who have provided guidance and encouragement throughout my time at UC Riverside, including members of my committee, instructors, and collaborators. To Drs. Diamond Bravo, Rebekah Richert, Aerika Loyd, and Olivia Atherton, thank you for your thoughtful advice and feedback on my work. I have learned so much from all of you and have truly enjoyed sharing my research and hearing your insights, which have strengthened my development as a scholar. You are all wonderful examples of what it means to be leaders and advocates in academia. To Dr. Annie Ditta, thank you for being an outstanding instructor who always goes above and beyond to support graduate student success, as well as for your

encouragement and support with my applications. I also want to thank Dr. George Rebok, an exceptional collaborator. I am grateful for his guidance and support since I joined Dr. Wu's lab, and for the wisdom he has shared about the field of aging research, which has greatly deepened my understanding.

This accomplishment would also not have been possible without the support of my undergraduate mentors at CSUF and UCI, who gave me the opportunity to grow as a Research Assistant and Teaching Assistant and helped prepare me for graduate school: Dr. Lisa Weisman-Davlanges, Dr. Russ Espinoza, and Dr. Jessica Borelli.

I would also like to acknowledge my lab mates from the CALLA Lab, Leah Ferguson, Isadora Farias, Bethany Tavenner, Sarah Castro, and Camryn Amundsen, for their support throughout this journey. I want to thank the many Research Assistants, who help make research possible. Your hard work and efforts have been crucial in every project, and I am sincerely grateful for your contributions.

To my graduate school best friends, LeNisha Williams and Ashley Marin, thank you for always lifting me up, inspiring me to be my best, and for being there to listen. I am especially grateful for all the times we pushed one another and relied on each other to succeed in our classes and research. You have both become such an important part of my personal life, and I have no doubt that our friendship will continue for years to come. I am so proud of you both, know that you will go very far, and wholeheartedly appreciate the role you played in making my graduate school experience so meaningful through your presence and unwavering support.

To the community collaborators and participants who contributed to the work

presented here, as well as throughout my PhD studies, thank you for your trust and for welcoming me into your spaces to learn from you. Your kindness and willingness to support me and my work have been a constant source of motivation. The shared commitment to creating healthier communities where people can age well is at the heart of why I pursue this work. Through this work, I have formed many wonderful connections with older adults in my community, which have been among the most meaningful aspects of my research experience. I am committed to ensuring your voice is heard in academia, because it matters.

I want to thank my family, whom I love dearly and who are at the root of who I am and why I am where I am today. Dad, Jesus Erik Rodriguez, and Mom, Luz Elena Rodriguez, thank you for the many sacrifices you have made throughout your lives to give my sister and me a better future. Thank you for making the decision to immigrate to this country and for ensuring that, even during the most challenging times, we always had a roof over our heads, food on the table, and each other. You are two of the hardest-working people I have ever known, and I cannot thank you enough for all that you have done. A lifetime is not enough to repay you. Papá y mamá, gracias por ser mis padres, a quienes amo con todo mi corazón. Si no fuera por ustedes y sus sacrificios, no estaría aquí el día de hoy. Siempre han sabido apoyarme de la mejor manera y siempre se los agradeceré. Estoy orgullosa de ser su hija.

To my husband, Omar Andrade, thank you for your unconditional support throughout this chapter of my life. Not only were you brave (and maybe a little crazy!) enough to plan a whole wedding and marry me while I was completing this PhD, but you

have also been incredibly caring and encouraging every step of the way. The ways you have supported me by taking on household responsibilities, cooking, and always making time to listen to my ideas during my busiest moments have meant the world to me and continue to remind me that marrying you was the best decision of my life. In many ways, we share this accomplishment, and I will always strive to support your dreams just as you have supported mine. I love you forever.

To my parents-in-law, Manuel Andrade and Elizabeth Andrade, thank you for your invaluable support. I truly appreciate the love and encouragement you have consistently shown me. Your genuine interest in my work has meant so much, and you have even become a part of it. Thank you to my father-in-law for attending one of my intervention sessions as a guest speaker and helping to motivate participants to pursue lifelong learning by sharing your own experiences as a foreign language learner. You are a wonderful example of what it means to learn for the joy of it. I love you both. Gracias por su apoyo siempre!

Thank you as well to Dr. Zain Alhashem, who has become like a brother to me, for your support, kindness, and encouragement. You have always made me feel proud of my accomplishments, and your presence in my life has meant so much to me.

Lastly, I not only want to acknowledge but dedicate this dissertation and degree to my incredible sister, Dr. Cynthia Rodriguez. You have set the perfect example for me to follow and have read every word of my work along the way. You have been there to console me, encourage me, and believe in me even when I struggled to believe in myself. You are the one who always knows how to make me feel better and the person who

helped me get to where I am today by showing me the path to pursuing a PhD. You are my rock, my role model, and my greatest inspiration. You have walked beside me through every step of my journey, constantly cheering me on and making me feel that I make you proud. I have always admired your intelligence and your selflessness. For these reasons (and so many more that could fill pages far beyond this dissertation), this work is dedicated to you. I love you endlessly.

Most importantly, I give thanks to God, to whom I owe everything. He is the driving force behind all that I do and the source of every blessing and opportunity in my life. I am grateful to Him for the path that led me to this doctoral program, for the many blessings I have received throughout this journey, and for placing the people mentioned here in my life to support and guide me along the way.

ABSTRACT OF THE DISSERTATION

Dismantling Learning Barriers to Empower Underserved Older Adults: Cognitive, Functional, and Psychosocial Benefits of a Community-Based Learning Intervention

by

Tania Melissa Rodriguez

Doctor of Philosophy, Graduate Program in Psychology

University of California, Riverside, June 2026

Dr. Rachel Wu, Chairperson

Given the rapid growth of older adults in the United States, there is a pressing need for research on aging, particularly on preventing trajectories of decline. Although some age-related declines in cognitive abilities are documented as part of normal aging, reduced engagement in novel and cognitively stimulating activities may contribute to these changes. Learning intervention research suggests that learning new skills can improve cognitive and functional abilities as well as other psychosocial outcomes among older adults, supporting healthy aging. These benefits may be especially important for underserved older adults, who face systemic inequities that increase their risk for adverse aging outcomes. However, there is limited research examining the impact of learning engagement among these populations, likely due to participation barriers such as financial, transportation, and language constraints.

This dissertation addresses this gap by presenting a tailored, community-based learning intervention designed to reduce participation barriers among Latino and Chinese older adults with low income. The aims were to: 1) examine the impact of participation on cognitive abilities, functional independence, and well-being, 2) investigate changes in learning motivation, learning self-efficacy, and aging expectations, and 3) evaluate implementation by identifying perceived barriers, facilitators, and value. A total of 39 participants engaged in learning English and technology, along with motivational discussions on healthy aging. Using a mixed-methods approach, data were collected pre- and post-intervention through cognitive tasks, surveys, and interviews.

Linear mixed-effects models revealed significant improvements in processing speed, functional independence, learning self-efficacy, and aging expectations, with a marginal increase in well-being. Higher self-reported engagement in the intervention was associated with greater cognitive gains. Interestingly, higher educational attainment predicted lower motivation and self-efficacy. Qualitative themes on outcomes contextualized, complemented, and expanded these findings. Barriers included mismatches in instructional pacing and proficiency, health and sensory challenges, forgetfulness, and distractions. Facilitators included accessible learning resources, multidimensional support, and participants' resilience. Participants described the intervention as an empowering and community-building experience.

These findings highlight the multifaceted benefits of learning among underserved older adults through tailored, community-based programs. Future research and policy

should prioritize equitable lifelong learning opportunities to support sustained engagement and promote healthy aging.

TABLE OF CONTENTS

Acknowledgments	iv
Abstract	ix
List of Tables	xv
List of Figures	xvii
CHAPTER 1: Introduction	1
Cognitive Aging and Learning Disengagement.....	2
Benefits of Learning Engagement in Older Adulthood.....	6
Other Beneficial Psychosocial Factors to Consider from Learning Engagement.....	11
Theoretical Frameworks Supporting Learning Engagement.....	15
Underserved Populations and Their Risk for Cognitive Decline	20
Barriers to Learning Among Underserved Older Adults.....	23
Community-Based Approach for Feasible Research Participation.....	26
Positive Behavior Support (PBS) Framework.....	27
Overview of Research.....	31
Research Questions & Hypotheses.....	33
CHAPTER 2: Methods	36
Study Design.....	36
Participants.....	36
Learning Intervention Design.....	39
Instructional Design.....	43
Procedure.....	49
Measures.....	51
Quantitative Analyses.....	65

Qualitative Analyses.....	67
Positionality Statement.....	70
CHAPTER 3: Quantitative Results on Cognition, Functional Independence, and Psychosocial Outcomes.....	72
Cognitive Outcomes.....	75
Functional Independence Outcome.....	85
Online Functional Independence Outcome.....	86
Well-Being Outcome.....	87
Learning Motivation Outcome.....	88
Learning Self-efficacy Outcome.....	89
Aging Expectations Outcome.....	90
Chapter 3 Summary.....	91
CHAPTER 4: Qualitative Themes on Cognition, Functional Independence, and Psychosocial Outcomes.....	94
Cognition Theme.....	95
Functional Independence Theme.....	100
Well-Being Themes.....	109
Learning Motivation Theme.....	121
Learning Self-Efficacy Theme.....	125
Chapter 4 Summary.....	128
CHAPTER 5: Learning Program Evaluation Results.....	130
Quantitative Ratings on Program Evaluation.....	130
Qualitative Findings on Program Evaluation.....	131
Learning Barriers and Challenges.....	132
Learning Facilitators and Strengths.....	145

Perceived Value and Impact of the Intervention.....	162
Lessons Learned: Recommendations for Future Learning Intervention Implementation.....	177
Chapter 5 Summary.....	183
CHAPTER 6: Discussion.....	187
Impact of the Learning Intervention on Cognitive, Functional, and Psychosocial Outcomes.....	189
Evaluation of the Learning Intervention.....	203
Theoretical Implications.....	217
Limitations.....	219
Future Directions.....	222
Conclusion.....	225
References.....	227
Appendices.....	263
Appendix A: English Class - TELACU Learning Program - Syllabus.....	263
Appendix B: Technology Class - TELACU Learning Program - Syllabus.....	267
Appendix C: Motivation Session - TELACU Learning Program - Syllabus.....	271
Appendix D: Quantitative Measures Survey.....	273
Appendix E: TabCAT.....	304
Appendix F: BTACT.....	307
Appendix G: Post-Intervention Interview Protocol.....	317
Appendix H: Tracking Weekly Level of Engagement Sheet.....	325
Appendix I: Demographic Survey.....	332
Appendix J: Overall Level of Engagement - Participant's Rating.....	335
Appendix K: Rating Experience in Learning Program.....	342

LIST OF TABLES

Table 1. Assessment Matrix for Proposed Intervention Study.....	51
Table 2. Descriptive Statistics.....	74
Table 3. Results of the Practice Effects Model for BTACT Global Cognition.....	76
Table 4. Results of the Linear Mixed-Effects Model for BTACT Global Cognition.....	77
Table 5. Results of the Practice Effects Model for TabCAT Global Cognition.....	78
Table 6. Results of the Linear Mixed-Effects Model for TabCAT Global Cognition.....	79
Table 7. Results of the Practice Effects Model for Processing Speed.....	80
Table 8. Results of the Linear Mixed-Effects Model for Processing Speed.....	81
Table 9. Results of the Practice Effects Model for Working Memory.....	82
Table 10. Results of the Linear Mixed-Effects Model for Working Memory.....	83
Table 11. Results of the Practice Effects Model for Cognitive Control.....	84
Table 12. Results of the Linear Mixed-Effects Model for Cognitive Control.....	85
Table 13. Results of the Linear Mixed-Effects Model for Functional Independence.....	86
Table 14. Results of the Linear Mixed-Effects Model for Online Functional Independence.....	87
Table 15. Results of the Linear Mixed-Effects Model for Well-Being.....	88
Table 16. Results of the Linear Mixed-Effects Model for Learning Motivation....	89
Table 17. Results of the Linear Mixed-Effects Model for Learning Self-Efficacy..	90
Table 18. Results of the Linear Mixed-Effects Model for Aging Expectations.....	91
Table 19. Integration of Cognitive Quantitative Outcomes and Qualitative Themes.....	99

Table 20. Integration of Functional Independence Quantitative Outcomes and Qualitative Themes.....	107
Table 21. Integration of Well-Being Quantitative Outcomes and Qualitative Themes.....	119
Table 22. Integration of Learning Motivation Quantitative Outcomes and Qualitative Themes.....	124
Table 23. Integration of Learning Self-Efficacy Quantitative Outcomes and Qualitative Themes.....	127
Table 24. Participants' Perceived Learning Barriers and Challenges Themes.....	143
Table 25. Participants' Perceived Learning Facilitators and Strengths Themes.....	159
Table 26. Participants' Perceived Value and Impact of the Learning Intervention Themes.....	174

LIST OF FIGURES

Figure 1. Pathway to healthy aging via novel skill learning for low-income minority middle-aged and older adults.....	25
Figure 2. Flow chart of recruited and assessed participants throughout the study...	38
Figure 3. PBS principles embedded in the learning intervention design.....	41
Figure 4. Learning materials provided for free to participants for English and technology classes, including a notebook, a folder, an English practice book, a pouch with supplies (e.g., pencils, pens, erasers, highlighters, sharpeners, and stylus pens), a Samsung Tab A8 tablet, a protective case, a water bottle, and a backpack.....	43
Figure 5. Older adult participants at the TELACU Las Fuentes community room engaging in the learning intervention.....	47
Figure 6. Participants celebrate the completion of the program by showing their certificates of completion and wearing their graduation cap and gown.....	49

CHAPTER 1

Introduction

The population of older adults in the United States (U.S.) has significantly increased and will continue to grow at an unprecedented rate (Ortman et al., 2014). Approximately 1 in 5 individuals in the U.S. will be an older adult by 2030 (Vespa et al., 2018). Additionally, the number of older adults is expected to double in size in the coming years and reach 95 million by 2060 (Vespa et al., 2018). Among the aging population, a large portion are projected to be racial/ethnic minoritized individuals, with Latinos/Hispanics and Asians being some of the fastest-growing groups (Administration for Community Living, 2024; Vespa et al., 2018). As the older adult population increasingly becomes more diverse (Mather & Scommegna, 2024), there is a need for more research to investigate strategies that help older adults age healthily, especially among underserved older adults. Underserved older adults, defined as those who are racial/ethnic minoritized individuals with low income, may have lower access to resources and opportunities due to systemic issues, placing them at a higher risk for negative aging outcomes (e.g., cognitive decline; Vila-Castelar et al., 2022; Zahodne et al., 2021).

This dissertation addresses the need to focus on aging populations within Psychology research and the dearth of studies with underserved older adults. In this chapter, I first review the literature on normal cognitive declines as part of the aging process and the potential role that learning disengagement has on such declines. Next, I highlight the research and theories that provide support regarding the positive impact that

lifelong learning and engaging in learning new skills during older adulthood has on the cognitive, functional, well-being and other psychosocial outcomes of older adults. Based on these empirical studies and reviewed theoretical frameworks, I discuss how learning engagement is a pathway for helping older adults achieve healthy aging outcomes. Then, I cover how research on learning interventions can be especially important to conduct with underserved older adults, given their higher risk for developing Alzheimer's disease and related dementias (ADRD), to help prevent cognitive declines that go beyond what is part of the normal aging process. Moreover, I describe the barriers to learning engagement among underserved older adults that must be acknowledged and adequately addressed in order to create effective learning interventions. Furthermore, I emphasize how taking on a community-based approach and implementing the Positive Behavior Support (PBS) framework can help create interventions for underserved populations that best mitigate participation barriers and promote positive aging outcomes. Lastly, I describe a tailored, community-based learning intervention study for underserved older adults that addresses their participation barriers to assess the effect of learning new skills on their cognitive, functional, well-being, and other psychosocial outcomes. The chapters that follow present the methods, results, and discussion of this research.

Cognitive Aging and Learning Disengagement

Research on cognitive aging indicates that individuals experience normal changes in their cognitive abilities as they age (Kirk, 2024; Salthouse, 2019). Cognitive abilities are essential for day-to-day function, and they can be understood across a variety of specific domains, which include: memory, executive function, processing speed,

language, attention, visuospatial abilities, perceptual-motor skills, and social cognition (Harada et al., 2013). While some cognitive abilities remain or even improve with age (e.g., social cognition, crystallized intelligence), other abilities are expected to decline (Salthouse, 2012). For example, processing speed (the rate to process information), executive function (planning, decision-making, and problem-solving skills), attention (the ability to focus and block-out distractions), working memory (ability to hold and manipulate information), and episodic memory (ability to remember personal specific experiences or events) tend to decline with age (Glisky, 2007; Harada et al., 2013; Lezak et al., 2012; Luszcz & Bryan, 1999; Salthouse et al., 1995, 1989). It is important to note that the expected degree of decline across these cognitive domains should not impair an individual's ability to perform day-to-day tasks (Anstey & Low, 2004; Alzheimer Society, 2025; Harada et al., 2013). As such, if an older adult experiences significant difficulties in their functional abilities, it may be due to other factors that could require further examination (e.g., medications, an illness, cognitive impairment, and dementia or other conditions).

The findings regarding the typical progression of cognitive aging and decline raise the following question: What are the underlying reasons for age-related cognitive changes in individuals? Neuroscience provides the explanation that changes in cognition are associated with structural and physiological brain changes that also occur as individuals age. For instance, there is a gradual shrinkage of brain volume due to a reduction in gray matter over time (Aljondi et al., 2019; Farokhian et al., 2017; Taki et al., 2011). The loss of brain volume is prominently observed in the prefrontal cortex,

which is responsible for executive functions (Friedman & Robbins, 2022). The temporal lobes also suffer from decreases in volume, affecting the hippocampus, which is involved in memory processes (Opitz, 2014; Raz et al., 2004). Moreover, there is also a loss of neurons that die and/or shrink (Lee & Kim, 2022; Shankar, 2010). Neurons are in charge of sending and receiving information, mediating the communication between our brain and body (Sivadas & Broadie, 2020). Given that neuronal death disrupts the neural connections that help this communication and processing of information, it directly and negatively impacts cognitive functions (e.g., memory, attention, learning, etc.). Beyond the link between neurological changes and cognitive decline, it is essential to recognize that there are other factors that can influence the degree and rate of cognitive decline that individuals experience (e.g., genetics, medical conditions, lifestyle; Cadar et al., 2012; Ganguli et al., 2020; Kim & Park, 2017; Lin et al., 2017). Thus, there is great variability in cognitive aging outcomes across individuals (Blazer et al., 2015).

Although there are several factors that can contribute to the decline in cognitive abilities as individuals age, disengagement from cognitively stimulating activities could be a driving factor. When individuals no longer participate in activities that are cognitively challenging (e.g., learning), there is a lack of cognitive stimulation, which could accelerate the process of cognitive decline (Gómez-Soria et al., 2023; Woods et al., 2023). Studies also show that engagement in cognitively-stimulating activities in middle and older adulthood can provide a pathway for increasing cognition, and potentially prevent cognitive declines that have become normalized. Schultz and colleagues (2015) found that higher participation in activities that promote cognitive stimulation was

associated with higher gray matter volumes in the brain and higher cognitive scores among middle-aged adults. Worschech et al. (2022) also found that cognitive stimulation via piano training led to increases in cortical thickness across 5 regions of the brain. These findings highlight that participating in cognitively engaging activities could go beyond increased performance in cognitive tasks, as it could also serve to preserve the brain structure. Moreover, a recent meta-analysis study by Gómez-Soria et al. (2023) found that cognitive stimulation not only contributes to improved cognitive function for cognitively healthy older adults, but also those with mild cognitive impairment and dementia. Hence, supporting and encouraging older adults to continue to engage in activities that demand cognitive effort can promote healthy cognitive outcomes in aging populations (Hughes, 2010).

Relatedly, it has been recently proposed that the decline in cognitive abilities associated with the disengagement of cognitively-stimulating activities could be attributed to the learning interruption or withdrawal that tends to occur in adulthood (Wu et al., 2024). For many individuals, formal learning takes place primarily during childhood, adolescence, and young adulthood. However, once an adult individual has attained the education or skills necessary for obtaining a job, formal learning opportunities are likely to decrease or stop altogether. For instance, if one retires or is not required to learn any new skills for their occupational position, they may no longer be incentivized to engage in learning. Lower cognitive stimulation due to reduced or absent learning in adulthood and older age may be playing a critical role in the cognitive declines observed. Various factors influence learning disengagement in adulthood,

especially in middle and older adulthood (e.g., time, financial, or opportunity constraints; Wu et al., 2024). A key factor, however, may be how learning resources and opportunities are underfunded for older adults and they are more prominently encouraged and prioritized for children and younger populations in society (Al Hazzouri et al 2021). The next section outlines how lifelong learning and learning new skills in older adulthood can be specifically used as stimulating fuel for greater cognitive health (Wu et al., 2017). It also emphasizes how, aside from cognitive benefits, learning can have additional positive effects that contribute to healthy aging (Morris-Foster, 2024; Yee et al., 2022).

Benefits of Learning Engagement in Older Adulthood

Optimal cognitive ability, functional independence, and well-being are all factors that contribute to healthy aging (Depp et al, 2010; Lawton & Brody, 1969; Rowe & Kahn, 1987; 1997). Engagement in learning during older adulthood has been shown to improve these beneficial factors (Alexandropoulos, 2024; Chan et al., 2016; Nguyen et al., 2020; Shapira et al., 2007; Wu et al., 2017). Thus, lifelong engagement in learning can be thought of as a tool that can ultimately foster healthy aging outcomes (Balog, 2018; Choi & Cho, 2021; Grosso, 2018; Harding et al., 2024; Morris-Foster, 2024; Simone & Sculli, 2006; Sloane-Seale & Kops, 2008; Yee et al., 2022). These outcomes have been highlighted by various learning intervention and lifelong learning experts. The research in this area is reviewed below.

Regarding cognitive function, learning interventions that focus on teaching older adults new skills have found improvements across several cognitive domains (e.g., working memory, cognitive control, processing speed; Bugos & Wang, 2022; Bugos et

al., 2007; Chan et al., 2016; Leanos et al., 2023; Noice et al., 2004; Park et al., 2014; Seinfeld et al., 2013). For instance, Chan et al. (2016) carried out an intervention that had two older adult participant groups. One group of participants learned to use technology via tablet devices, and the other group was a control group (with two sub-conditions - a placebo group and a social group). Results showed that, in contrast to the control group, participants in the learning group experienced greater increases in their episodic memory and processing speed. Moreover, Bugos and colleagues (2007) conducted a study where older adult participants in the experimental group learned how to play the piano across 6 months. Relative to the no-treatment control group, those who took the piano lessons had significant enhancements in their executive function and working memory. Bugos & Wang (2022) also found that participants placed in a piano training condition and a computer-assisted cognitive training condition experienced greater improvements in working memory and processing speed in comparison to a no-treatment control group. Similarly, Seinfeld et al. (2013) found that teaching older adults to play the piano during 4 months led to a significant increase in executive function among participants.

Aside from single-skill learning interventions, there are also intervention studies where the researchers have decided to increase the number and variety of skills being taught to participants to assess cognitive outcomes. Park et al. (2014) executed a study where older adult participants in the experimental group were placed in 1 of 3 learning conditions, which included: 1) learning digital photography only, 2) learning to quilt only, and 3) simultaneously learning both skills - digital photography and quilting. In the control group, there were 3 conditions: 1) a placebo group, 2) a no-treatment group, and

3) a social group. Findings revealed that episodic memory increased more for participants in each of the learning conditions than those in any of the three conditions of the control group. This study specifically suggested that there is greater cognitive benefit derived from participating in cognitively stimulating activities than engagement in social activities. Another remarkable example of multi-skill learning is the study conducted by Leanos et al. (2023) in which older adult participants were required to learn a minimum of 3 new skills at the same time out of 5 options (a new language, how to use an iPad, photography, drawing, and music composition) during a period of 3 months. Within 6 weeks of the study, participants had already experienced an increase in cognitive control and working memory to middle-aged levels (30 years younger). One year after their participation, their cognitive abilities approached young-adult levels (50 years younger; Ferguson et al., 2023). Ultimately, later-life learning engagement, whether through educational or skill training courses, has been linked to better cognitive outcomes over time (Wang et al., 2025).

In addition to cognitive benefits, learning new skills is useful to improve functional ability and independence in older adulthood. Laal & Salamanti (2012) argue that lifelong learning is a beneficial *need* as individuals are required to develop new skills throughout life to assist them in navigating a world that is constantly changing and evolving. Lifelong learning is notable for its role in helping older adults successfully adapt to changes in their environment and within themselves to remain functionally independent and active members of society (Brink, 2017; Choi & Cho, 2021; Nguyen et al., 2020; Tam, 2018). For example, if we focus on the skill of technology literacy, there

are several functional benefits that older adults can derive from knowing how to operate and navigate technology. Technology literacy opens the door to using online services, such as online banking, online transportation requests, online grocery shopping, telehealth, etc., all of which can facilitate independence in day-to-day tasks (Chan et al., 2016; Charness & Boot, 2009; Shapira et al., 2007). Learning technology can also lead to continued employment and/or increased job opportunities as a result of staying up-to-date with technological advancements (Lee et al., 2008; Raemdonck et al., 2014), which can also contribute to financial independence. Another example is how learning a new language can also help individuals to independently communicate with others without needing assistance from someone else for translation (e.g., individuals who speak a different language other than English needing to communicate with service providers in the U.S.).

The impact of learning on the well-being of older adults has also been well documented and acknowledged in the literature (Formosa, 2019; Field, 2009, 2011; Jenkins, 2011; Merriam & Kee, 2014). Noice and colleagues (2004) found that older adults who participated in theater arts training did not only exhibit greater cognitive function in comparison to a non-treatment group, but also higher scores in well-being measures. Shapira and colleagues (2007) showed that training older adults to learn how to use computers and the Internet significantly contributed to their well-being. Jenkins & Mostafa (2015) analyzed data from the English Longitudinal Study of Ageing (ELSA) and found that partaking in learning activities was linked to higher well-being. Fang & Sim (2024) also found that participation in class activities (e.g., music, dance) was

positively correlated to well-being outcomes among a sample of Singaporean older adults. Furthermore, a survey study with older adult learners enrolled in a Canadian public continuing education program that offered non-credit courses (e.g., language, computer, crafts, music, dance, etc.) revealed that learning participation was positively and independently associated with well-being (Narushima & Diestelkamp, 2018a). Narushima & Diestelkamp (2018b) identified that older adults that engaged in lifelong learning found it to be a therapeutic self-help mechanism, which played a positive role in their well-being. Notably, Li et al. (2023) found that learning engagement was positively associated with subjective well-being among disadvantaged older adults, suggesting that partaking in learning may be particularly beneficial for underserved populations.

In conjunction with well-being, studies have also found that engagement in learning has a positive effect on the quality of life of older adults (Escuder-Mollon et al., 2014; Leung & Liu, 2011; Molina & Schettini, 2021; Seinfeld et al., 2013). Therefore, it is no surprise that learning engagement has an advantageous impact on well-being, as it is through learning that older adults may remain socially engaged and included within their communities and in society overall (Feinstein et al., 2004; Findsen & Formosa, 2011; Joseph & Human, 2020; Suyono, 2021). Perkins and Willamon (2014) explored the impact that learning musical instruments has on the well-being of older adults through quantitative and qualitative data methods. The authors found that learning offered significant well-being benefits to the participants, and that some of the themes highlighting ways in which learning enhances well-being include experiencing pleasure in learning and being able to socially interact and connect with other people. Aside from

social capital, learning also works as a means to fulfill personal goals and feel empowered (Hachem et al., 2017, Liu et al., 2023; Maulod & Lu, 2020). Learning in older adulthood has also been reported to increase self-esteem, life satisfaction, and psychological and physical health (Dench & Regan, 2000; Law et al., 2023; Narushima, 2008; Narushima et al., 2013; Talmage et al., 2018a; Yamashita et al., 2017; Yamashita et al., 2018). These factors can, in turn, all contribute to increased well-being.

In sum, an enriched environment that promotes learning engagement among older adults can have cognitive, functional, and well-being gains that outline a path toward healthy aging (Morris-Foster, 2024; Simone & Sculli, 2006; Yee et al., 2022). In the next section, I describe other potentially beneficial psychosocial factors that can be achieved through learning engagement, yet are often understudied as outcomes in learning interventions with older adults.

Other Beneficial Psychosocial Factors to Consider from Learning Engagement

Other potential learning benefits in older adulthood that have been examined more frequently as predictors than as outcomes of learning engagement include learning motivation and learning self-efficacy. First, learning motivation is a psychosocial construct that involves internal (intrinsic) and/or external (extrinsic) drives that influence an individual's willingness or desire to engage in learning (Ryan & Deci, 2000). Learning motivation has been primarily studied to examine its impact on learning or to identify the reasons and level of motivation older adults have to engage in learning (e.g., Chang & Lin, 2011; Li et al., 2025; Xiong & Zuo, 2019; Yamashita et al., 2019; Yi-Yin, 2011). The key learning engagement motivators that have been identified among older adults

include: the desire to acquire knowledge or skills (especially those relevant to health or adaptation to environmental changes), staying up to date with society, intrinsic curiosity and interest in learning, cognitive enhancement, increased social contact and engagement, and contributing to society by helping others (Cachioni et al., 2014; Hachem, 2023; Kim & Merriam, 2004; Wei et al., 2024; Xiong & Zuo, 2019). However, there are less studies that measure motivation as an outcome of participation in a learning experience.

Motivation to learn may change as a consequence of learning engagement, rather than just serving as a precursor or predictor of learning participation. Some interventions with older adults have found that motivational changes can occur following participation, and that these changes are associated with continued engagement after an intervention has concluded. For example, resistance and physical activity training interventions have shown increases in exercise-related motivation from pre- to post-intervention, and it predicts continued engagement after completing their participation (Cross et al., 2023; Kekäläinen et al., 2018). Similarly, an intervention focused on robot-assisted training for older adults with dementia found that participants experienced an increase in intrinsic motivation as a result of their engagement in learning to interact with and use a robot (Fung & Mow, 2025). Together, these findings suggest that increased motivation may represent a beneficial outcome of engaging in learning opportunities. Motivation as an outcome needs to be further explored in learning programs for older adults.

Learning self-efficacy is another psychosocial factor that has been understudied as an outcome of learning engagement. The construct of learning self-efficacy refers to an individual's belief in their ability and/or capacity to effectively learn and apply new

knowledge or skills (Bandura, 1997; Zimmerman, 2000). Older adults have reported feeling low confidence and lacking competence to learn new things, often reflecting age-related stereotypes (Dunlosky & Hertzog, 1998; Rodriguez et al., 2025a). Having low learning self-efficacy can negatively impact older adults' motivation to engage in learning (Phipps et al., 2013). If older adults feel that they are not able to learn new things, they may decide or lack the desire to engage in learning to begin with, preventing them from seeking or agreeing to participate in new learning opportunities. At the same time, learning experiences can also influence an individual's learning self-efficacy. When an older adult decides to engage in learning something new and demonstrate to themselves that they are capable of learning, despite potentially having initial doubts regarding their own competence, this may lead to increases in learning self-efficacy. Conversely, if an older adult faces difficulties during a learning experience, that may lead them to feel incompetent and disengage from learning. Thus, learning self-efficacy is not only important as a predictor of learning engagement, but also as an outcome. Nonetheless, there is a lack of learning intervention studies that measure self-efficacy as an outcome of learning engagement in older adulthood. Existing research has largely examined self-efficacy as an outcome in health and behavioral interventions with older adults (e.g., Jalali et al., 2025; Tavakoly Sany et al., 2024; Yang et al., 2021), as opposed to within learning or educational contexts. An area of research that has measured self-efficacy as an outcome that more closely relates to skill learning interventions with older adults is digital and technology training (e.g., Dong et al., 2023). For instance, Laganà and colleagues (2008; 2011) conducted studies that assessed whether

participating in a computer training program would enhance older adults' computer self-efficacy. After 6 weeks of training, participants had significantly improved their self-perceived competence and confidence for learning and using a computer. Investigating the impact of learning engagement on general learning self-efficacy is necessary to better understand how educational experiences change older adults' confidence in their ability to learn.

Engaging in learning during older adulthood may also lead to changes or shifts in aging expectations, especially when learning about positive and healthy aging strategies that counteract the narrative of negative aging stereotypes. Aging expectations are individuals' views or beliefs about what to expect from the aging process across physical, cognitive, and social aspects in older adulthood (Sarkisian et al., 2002a). Typically, aging expectations are assessed to predict how beliefs about aging relate to specific behavioral outcomes in older adults (e.g., physical activity, social engagement; Breda & Watts, 2017; Meisner et al., 2013; Menkin et al., 2017; Sarkisian et al., 2005a). In some studies, aging expectations and/or perceptions are measured as an outcome, typically in interventions aimed at reducing ageism and increasing positive attitudes toward aging (e.g., Burnes et al., 2016; Sabatini et al., 2025; Whatley & Castel, 2020; Zhu et al., 2025). However, there is a dearth of studies that measure aging expectations as an outcome of participating in learning interventions designed for older adults. Assessing and improving aging expectations among older adults is critical as perceptions of aging can shape aging outcomes through self-fulfilling processes, as proposed by the stereotype embodiment theory (Levy 2009). Concerningly, a recent systematic review and meta-analysis found

that older adults hold relatively low aging expectations (Lin et al., 2024). Learning interventions that incorporate motivational discussions with strategies for achieving healthy aging may help older adults challenge internalized aging stereotypes and reframe their beliefs about the aging process. By engaging in learning experiences and demonstrating that age is not an impediment for continued growth and skill acquisition, older adults may experience an increase in their learning self-efficacy and aging expectations.

Overall, learning engagement has the potential to generate several psychosocial benefits that extend beyond functional and cognitive outcomes. Learning motivation, learning self-efficacy, and aging expectations may all be enhanced among older adults as a result of learning engagement, yet these outcomes are understudied. Limited studies have explicitly measured these outcomes as a result of learning participation. Therefore, expanding on this research is necessary to better understand the multifaceted impact of learning in later life. In the following section, I provide an overview of the theoretical frameworks that further support the importance of learning during aging.

Theoretical Frameworks Supporting Learning Engagement

Besides the empirical evidence reviewed, several theoretical frameworks provide a foundation for understanding why learning engagement is particularly beneficial in older adulthood. While many frameworks could be applied, the ones highlighted here are especially relevant: 1) use-it-or-lose-it hypothesis, 2) cognitive reserve theory, 3) activity theory of aging, 4) selection, optimization, and compensation (SOC) theory, and 5) transformative learning theory. These frameworks offer mechanistic insights into how

learning experiences can influence cognitive, physical, and psychosocial outcomes in older adults.

Use-it-or-lose-it Hypothesis

The use-it-or-lose-it hypothesis suggests that cognitive and physical abilities decline (or are “lost”) when not actively exercised, whereas continued use of abilities helps maintain or strengthen them (Hultsch et al., 1999). According to this hypothesis, a lack of cognitive stimulation will result in weakened neuronal pathways, while regular stimulation through cognitively demanding activities will sustain existing and promote new neuronal connections. Similarly, physical abilities deteriorate when they are not regularly practiced, but continued use of physical abilities helps maintain strength, mobility, and coordination. Participating in learning opportunities, particularly those focused on acquiring new skills, helps exercise and engages multiple cognitive processes such as memory, attention, problem-solving, and executive functioning (Harris & Bacon, 2019; Hertzog et al., 2008; Hoque, 2016). When learning new skills involves physical or motor engagement, functional abilities may be further supported. From this perspective, learning engagement serves as a mechanism for sustaining cognitive and physical functioning, fostering continued independence in older adulthood.

Cognitive Reserve Theory

Cognitive reserve theory proposes that engaging in cognitively stimulating activities can enhance an individual’s ability to cope with age-related changes in the brain and/or delay cognitive decline (Stern, 2002). This theory suggests that brain-enriching experiences throughout life build up a “reserve” that allows the brain to be more resilient

in the face of pathology and compensate for cognitive or neuronal changes and losses (Pinto & Tandel, 2016; Wang et al., 2017). The factors that contribute to building this reserve include cognitively demanding occupations, social engagement, and education (Opdebeeck et al., 2016; Pinto & Tandel, 2016; Richards et al., 2013). Lifelong learning and acquiring new skills are especially important because they are an avenue for continued cognitive stimulation that encourages the development of new neuronal connections, strengthening the brain's reserve and expanding its capacity (Wenzel et al., 2024; Zheng, 2025).

Activity Theory of Aging

Activity theory of aging posits that continued engagement in activities that are considered meaningful contributes to greater life satisfaction and well-being in older adulthood (Havighurst & Albrecht, 1953; Havighurst, 1961). Meaningful activities include working, volunteering, having hobbies, and socializing. A key aspect of this theory is the need to substitute old roles with new ones to remain socially engaged, as opposed to withdrawing from society due to age-related life and role transitions. For example, retirement is common in older adulthood, which can lead to the loss of work-related roles and a reduced sense of purpose (Lewis & Hill, 2020). Thus, seeking alternative forms of social participation by replacing old work-related roles with new meaningful roles helps older adults adapt as they transition into aging and experience identity shifts. Acquiring new roles or engaging in new activities usually requires learning new skills. In this context, learning engagement itself can serve as an activity

that facilitates new role development and provides intellectual, cognitive, and social stimulation, supporting well-being and positive aging outcomes.

Selection, Optimization, and Compensation (SOC) Theory

The selection, optimization, and compensation (SOC) theory focuses on the importance of employing adaptive strategies in older adulthood to maintain functioning and well-being in response to age-related changes and achieve successful aging (Baltes & Baltes, 1990). Selection involves choosing and prioritizing goals that are meaningful and attainable. Optimization refers to maximizing resources needed to accomplish those goals. Compensation represents the use of alternative means to replace losses in resources or abilities. This theory aligns with the activity theory of aging in that they both emphasize adaptation to avoid disengagement in older adulthood. Learning engagement can serve as a mechanism for SOC by allowing older adults to selectively focus on learning preferred skills that help them optimize gains and compensate for age-related losses (e.g., Koh et al., 2025; Moghimi et al., 2019). For example, an older adult experiencing age-related changes in vision or motor control may opt to engage in technology training to learn how to use assistive digital tools to read and send text messages. As the older adult learns and applies these technological skills, they optimize their existing abilities and compensate for functional limitations, which helps them remain independent.

Transformative Learning Theory

Transformative learning theory conceptualizes learning in adulthood as a process that extends beyond the acquisition of knowledge or skills. This theory emphasizes

learning engagement as a means through which adults can reflect on their beliefs, assumptions, and previous experiences, leading to shifts in their perspective, behavioral changes, and personal growth (Mezirow, 1991; 1995; 1997). The framework outlines several phases that adult learners may experience during transformative learning. These phases include: 1) a disorienting dilemma, in which adults encounter experiences that challenge their existing expectations or beliefs; 2) self-examination, a process in which learners will assess how their prior experiences connect to the disorienting dilemma; 3) critical assessment of assumptions, which involves questioning previous beliefs; 4) planning a course of action to further explore and understand newly recognized perspectives; 5) acquisition of knowledge or skills, where the learning occurs to help support their new perspectives; 6) exploration and experimentation of new roles or behaviors; and 7) building competence and self-efficacy through continued engagement of these new roles and behaviors (Mezirow, 1991; 2000). Within this framework, older adults who engage in learning may confront internalized stereotypes about aging, such as beliefs that cognitive decline is inevitable or that older adults are no longer capable of learning new skills. Through active participation in learning opportunities, older adults can revise these beliefs by observing their own capacity to acquire new knowledge or skills, demonstrating that age is not an impediment to learning. This realization may then contribute to the development of more positive aging expectations overall. Additionally, as older adults successfully master new skills, they may experience increases in their learning self-efficacy and motivation to continue learning.

Altogether, these frameworks support learning engagement as a critical factor for successfully adapting to changes in later life and promoting sustained cognitive and physical functioning as well as psychological well-being. The section below describes how learning engagement may be specifically beneficial for underserved older adults who are at high risk of experiencing declines.

Underserved Populations and Their Risk for Cognitive Decline

While a certain degree of decline in cognition is considered normal as individuals age (Kirk, 2024; Salthouse, 2019), there are populations that are at a higher risk of experiencing abnormal declines and developing neurodegenerative disorders, such as Alzheimer's disease and related dementias (ADRD). Underserved populations such as racial/ethnic minoritized groups have been reported to obtain lower scores in cognitive assessments in comparison to more privileged groups (e.g., White individuals; Díaz-Venegas et al., 2016, 2019; Schwartz et al., 2004; Sloan & Wang, 2005). These cognitive health disparities extend beyond scores in cognitive tests, as racial/ethnic minoritized older adults are also more likely to develop ADRD (Wright et al., 2021). For instance, Latinos have a 1.5 times higher likelihood of having ADRD as opposed to White individuals (Alzheimer's Association, 2020; 2021). It is estimated that Latinos will have the highest increase in rates of ADRD by 2060 in contrast to other racial/ethnic groups (Alzheimer's Association, 2010; Matthews et al., 2019). ADRD is a devastating condition that deteriorates individuals' ability to act and think for themselves, leading them to becoming dependent on others to help them with day-to-day activities (Porsteinsson et al., 2021; Talmelli et al., 2010). Ultimately, ADRD threatens an

individual's opportunity to achieve healthy aging outcomes, as it compromises cognitive and functional abilities (Depp et al., 2010; Lawton & Brody, 1969; Rowe & Khan, 1987, 1997). Thus, there is an urgent need to conduct research that investigates how we can increase cognitive health and prevent ADRD among underserved populations.

Factors that contribute to these cognitive health disparities tend to be rooted in systemic inequities that affect underserved groups in the United States (Bailey et al., 2017; Palms et al., 2025), and these are: low socioeconomic status (including income, education levels, and wealth) prevalence of chronic health conditions, and lifelong stressors based on discrimination and financial burdens (Rebok et al., 2024). Latinos are disproportionately affected by low socioeconomic status and low educational attainment levels in comparison to other racial/ethnic groups (Bhutta, 2020; Duffin, 2021; Feagin & Cobas, 2015; Gradín, 2012; Hanson, 2025; U.S. Census Bureau, 2017). In terms of socioeconomic status, research has shown that there is a link between having low socioeconomic standing and being at higher risk of cognitive impairment (Greenfeld & Moorman, 2019; Larnyo et al., 2022; Marden et al., 2017). On the other hand, higher educational attainment has been associated with a lower risk of developing ADRD (Caamaño-Isorna et al., 2006; Garcia et al., 2018). In terms of physical health, Latinos also face higher rates of type 2 diabetes and obesity (Hales et al., 2017; Schneiderman et al., 2014; Stierman et al., 2021), which are two chronic health conditions that have been reported to play a role in cognitive impairment and ADRD (Gregg et al., 2000; Luchsinger et al., 2001; Noble et al. 2012; Whitmer et al., 2008). Overall, Latinos experience high levels of stress as a result of being discriminated against and having to

navigate financial burdens and scarcity of resources, which has also been reported to have a detrimental impact on cognitive health (Appelhans, 2023; Forrester et al., 2019; Mani et al., 2020; Zhao & Tomm, 2018). While addressing these factors since younger ages is essential to prevent and combat cognitive health disparities, it is just as important to identify solutions for individuals who are already in their older age and have experienced a lifetime of inequities.

The research reviewed on learning engagement offers promising results to combating cognitive health declines. However, most learning interventions have been prominently conducted with White, middle-to-high income older adults. Tzuang and colleagues (2018) have pointed out that only a handful of cognitive interventions out of hundreds have included some representation of racial/ethnic minoritized individuals in their sample. As such, there is limited knowledge on how underserved older adult groups (e.g., racial/ethnic minoritized older adults with a low income) may benefit from learning new skills.

A study focused on identifying the characteristics of individuals who tend to participate in late-life learning programs revealed that participants tend to be White and of high educational levels (Wenzel et al., 2024). Older adults with low educational attainment and socioeconomic status are less likely to participate in lifelong learning programs (Chin et al., 2024, 2026; Hansen et al., 2019; Kump & Krašovec, 2007). Evidently, more research is needed to further identify the impact that late-life learning has among underserved populations to encourage policy makers to integrate more learning

programs for older adults who may have less access to resources and learning opportunities (Hazzouri et al., 2021).

Given the findings on the impact that engagement in learning new skills can have on cognition, functional independence, and well-being, it is imperative that learning interventions be tested with Latinos and other underserved populations to assess their potential for fostering healthy aging in these at-risk groups. Since one of the factors that contribute to cognitive health is educational levels, underserved older adult populations may be able to benefit more from having learning opportunities in their aging years to counterbalance the lack of educational opportunities from their younger years. Indeed, a study found that increased engagement in cognitively-stimulating activities has a greater impact among older adults who have lower educational attainment (Stieger & Lachman, 2021). As such, addressing structural inequities in access to learning opportunities for older adults is critical to ensuring that those who may benefit most are not excluded from participation.

The next section discusses how there are barriers to learning participation that may impede or make it challenging for underserved older adults to engage in learning opportunities/interventions. Such barriers must be considered and mitigated in order to provide feasible and effective learning experiences for underserved older adult populations.

Barriers to Learning Among Underserved Older Adults

Despite the need to conduct more learning interventions and provide learning opportunities for underserved older adults, there are barriers that these populations face to

learning engagement. Wu et al. (2021) posited that learning new skills in older adulthood is considered a privilege given that only some individuals are able to access the resources needed for learning. Rodriguez and colleagues (2022) developed a theoretical framework to explain why underserved older adult populations are not well represented in learning interventions and do not participate in learning programs to the same degree that more privileged groups do. Rodriguez et al. (2022) proposed that there are barriers to accessing the necessary learning resources for learning engagement for underserved older adults, which limits their ability to feasibly participate in learning. The framework indicates that addressing barriers to learning engagement can lead to increased feasible learning participation, which can result in increased cognitive and functional abilities, and thus, lead to healthy aging (**Figure 1**; Rodriguez et al., 2022).

Following this framework, resources required for learning are organized into three main categories: 1) direct learning resources, 2) indirect learning resources, and 3) motivation to learn. Direct learning resources represent the tools, materials, and learning opportunities available for one to engage in learning any given skill (e.g., paint, canvases, brushes, and a painting instructor to learn how to paint). Indirect learning resources are those that indirectly help facilitate one's engagement in learning, such as transportation to attend classes, financial means to pay for classes and/or learning materials, etc. Motivation to learn encompasses the fuel needed to be interested in and pursue the goal of learning, which is linked with self-efficacy or confidence in one's learning abilities. Barriers to resources within any of these three categories must be mitigated to effectively promote learning engagement for underserved populations.

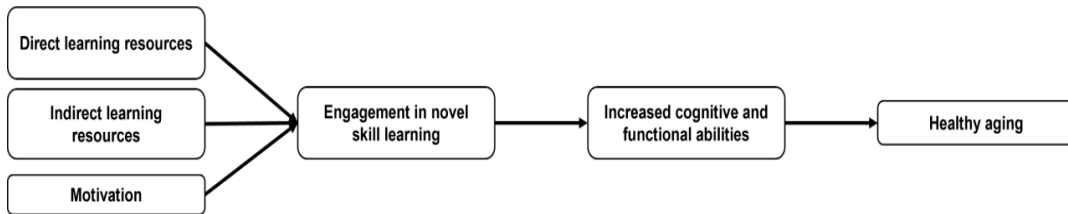


Figure 1. Pathway to healthy aging via novel skill learning for low-income minority middle-aged and older adults (Rodriguez et al., 2022).

In line with this theoretical framework, we conducted a qualitative study to identify the perceived learning barriers that specifically impact Latino older adults with a low income (Rodriguez et al., 2025a). In terms of direct learning resource barriers, we found that participants did not know about available opportunities for skill learning in their community or were unsure about what options they had to learn. For indirect learning resources, participants faced transportation issues, language barriers (as they were not English speakers), time constraints, and did not have the financial resources to pay for classes and/or learning materials. Lastly, regarding motivation, some participants expressed that they lacked the motivation to learn because they or family members felt that they were too old to learn. These findings are comparable to other studies that have also found that some of the most prominent barriers to participating in lifelong learning among older adults include: costs, transportation, time, self-doubt in learning abilities, low awareness of available learning opportunities, and lack of motivation and support from family and society (Alexandropoulos, 2024; Günen et al., 2023; Hansen et al., 2019; Hosnjak et al., 2020; Laal, 2011; Laal & Laal, 2012; Leung et al., 2006). Accounting for the learning barriers that underserved older adults have is an important and first step to encouraging learning engagement in a feasible manner.

Community-Based Approach for Feasible Research Participation

Reducing or eliminating barriers to research participation in general among underserved populations has been a constant challenge. Besides the aforementioned barriers related to specific participation in learning, there are other barriers to participating in research studies for marginalized individuals. For example, there could be mistrust, fear, and cultural barriers as well as lack of information or knowledge on how research works, all of which can deter underserved individuals from participating in research projects (Calderón et al., 2006; George et al., 2014; Levkoff & Sanchez, 2003; Shedlin et al., 2011). Research in psychology consists primarily of studies conducted with Western, Educated, Industrialized, Rich, and Democratic (WEIRD) samples (Henrich et al., 2010; Konkel, 2015; Thalmayer et al., 2021). Efforts must be implemented to ensure that underserved populations are able to participate in research studies with more frequency.

Directly working with community organizations has demonstrated to be an effective avenue to help combat the underrepresentation of marginalized groups and bring research opportunities to otherwise hard-to-reach populations (Bekteshi et al., 2024; Bonevski et al., 2024; Collins et al., 2018; Marchant et al., 2025). Community-based research encompasses partnering and collaborating with community leaders and members to address issues that are of importance to the community. The research is built to reflect the priorities, cultural values, and needs of a community. Centering the research approach on the community's needs helps foster trust, enhances recruitment and retention of participants, empowers the community, and increases the impact and quality of the

research project, leading to sustainable research outcomes (Jagosh et al., 2012). Overall, community-based approaches make participation in research more accessible and successful. For intervention-related work, hosting research activities within a community setting that participants are familiarized with and comfortable in is optimal (e.g., Habibi et al., 2022). As such, when aiming to conduct a learning intervention for underserved older adults, taking on a community-based approach is key for the project and involved parties to thrive, especially when some of the research barriers and learning engagement barriers may overlap (e.g., language, transportation).

The following section introduces a framework that serves as a guide to building community-based interventions that could be used to proactively address learning barriers and increase learning engagement among underserved older adults.

Positive Behavior Support (PBS) Framework

To support learning engagement among individuals who may face learning barriers, it is useful to implement the Positive Behavior Support (PBS) framework when designing a learning intervention within a community aimed at addressing those barriers. PBS is an evidence-based framework that adopts a proactive approach to help support individuals change their lifestyle or behavior by identifying and modifying the environmental factors that influence behavior, with the goal of enhancing their quality of life and producing positive change (Carr et al., 2002). This framework is shaped by multiple theoretical perspectives in the fields of environmental psychology, cultural psychology, community psychology, and ecological psychology (e.g., ecological systems theory; Bronfenbrenner, 2000). PBS involves system-level change, which refers to not

only focusing on the behaviors targeted for improvement but also on restructuring the surrounding systems and environment to make sure change can be sustained over time as opposed to momentarily. Positive behaviors within the framework include the skills that help increase individuals' likelihood of success and satisfaction across different settings (e.g., education, work, community), and support entails providing the educational strategies to strengthen and expand those skills. Ultimately, PBS guides and facilitates the process of designing interventions that target behavior change for the benefit of the individual. Intervention planning under PBS emphasizes empowering underserved individuals through community participation. The key features and principles of PBS are described below.

The fundamental features and principles that comprise PBS are: 1) inclusivity, 2) person-centered values, 3) a life span perspective, 4) ecological validity, 5) stakeholder participation, 6) social validity, 7) flexible implementation of multiple assessment approaches, and 8) prevention. PBS views inclusivity as a core principle, which refers to ensuring that underserved individuals have equitable access to resources and opportunities within educational contexts. While PBS originally focused on inclusivity for individuals with disabilities, it is also applicable to other populations that are often marginalized. In addition to inclusivity, PBS is guided by person-centered values to help identify goals and needs of individuals to create tailored interventions that help them achieve those goals and meet those needs. Moreover, this framework upholds a life span perspective, acknowledging that behavioral change is an ongoing, life-long process that requires supportive strategies to be added or modified over time. PBS also prioritizes

ecological validity as interventions under this framework are meant to be applied in real-life environments, as opposed to controlled or laboratory-based settings. PBS encourages stakeholder participation as a key feature where educators, family members, peers, and the participants themselves all contribute to planning and the application of intervention strategies that are as relevant and feasible as possible. In the same vein, PBS highlights the importance of social validity, as it supports the evaluation of interventions to determine their practicality and their effectiveness from the perspective of participants and other relevant stakeholders. PBS also supports flexible implementation of multiple assessment procedures to comprehensively collect contextually relevant data, including direct observations, self-report measures, questionnaires, interviews, and other types of qualitative approaches. Another principle of PBS is the emphasis on prevention by using strategies that proactively lower the likelihood of undesired outcomes. Together, these features and principles make PBS a powerful framework that helps guide the design of fruitful community-based interventions.

How would PBS specifically guide and be represented in the planning and execution of a tailored learning intervention for underserved older adults? Within the context of combatting learning barriers to increase learning engagement among underserved older adults, PBS provides a structured approach to addressing barriers via the design of an intervention that integrates system-level change. In contrast to other frameworks that primarily focus on instructional design (e.g., adult learning theory; Knowles, 1968), PBS explicitly focuses on the interactive dynamic between individuals and their environments, using contextual modifications to reduce learning barriers and

support sustained engagement. A tailored learning intervention would specifically mirror the principles of PBS described above in the following manner. First, inclusivity in the intervention would entail ensuring that all learning materials and information are equally accessible among all participants to promote feasible participation. Second, the intervention would be person-centered by ensuring that the learning goals and needs of the older adult participants are well addressed within its design, which would require understanding which skills they want to and would benefit from learning as well as identifying which are their personal learning barriers to mitigate. Third, a learning intervention that takes on a life span perspective would provide older adults with the tools and motivation to help them continue their learning engagement beyond completion of the intervention period. Fourth, to prioritize ecological validity, the intervention would have to be within a community setting that the older adults are familiar with and already use regularly, which can specifically help minimize transportation barriers to participating. Fifth, to exemplify stakeholder participation, the methods implemented in the learning intervention must be informed by the individuals that form part of the community participating and/or hosting the learning program, and by those that will play a role in the learning process of the older adults. Implementing stakeholder participation ensures that potential barriers are identified from different angles and that all parties involved work together to ensure that they are adequately addressed. Sixth, social validity would be integrated by asking the older adult participants and other relevant individuals to evaluate their experience in the learning program, which would generate useful information on whether the learning barriers were successfully removed and how future

interventions could be improved to increase their effectiveness. Furthermore, flexible implementation of assessments to document the impact of the learning intervention would require multiple assessment methods to collect data. Data collection methods would involve observational data of the older adults' engagement in the program, self-report surveys that ask participants to rate their learning experience, semi-structured interviews that prompt participants to share their thoughts and engagement experiences, and quantitative measures to gather numerical data on specific outcomes (e.g., cognitive tasks, well-being questionnaires). Lastly, emphasizing prevention as part of a learning intervention for older adults would imply teaching them new skills and information that helps foster healthy aging outcomes and prevent future physical, cognitive, and psychological decline.

In conclusion, PBS is a strong framework well suited for designing learning interventions that proactively addresses barriers to increase learning engagement and positive outcomes among underserved older adult populations.

Overview of Research

Drawing from the Rodriguez et al. (2022) and the PBS (Carr et al., 2002) frameworks in combination with the research on learning new skills, this dissertation assesses the impact of a tailored, community-based learning intervention that addresses barriers to participation among underserved older adults. As mentioned, most of the current research on the benefits of learning is derived from work with more privileged samples (e.g., White, middle-to-high income older adults). Thus, there is a need for understanding whether learning new skills will have the same (or better) effect on

underserved older adults. This project addresses this gap in knowledge on how underserved groups of older adults are impacted by engaging in learning two new skills simultaneously (e.g., English and technology).

Given the effectiveness of implementing a community-based approach to reach marginalized groups (Jagosh et al., 2012), to conduct this work, we have partnered with a community organization - The East Los Angeles Community Union (TELACU). This non-profit organization provides housing to seniors with a low income, the majority of which are racial/ethnic minoritized individuals. They have several local residential facilities near our institution. We specifically collaborated with one of their residential facility locations for the presented research: TELACU Las Fuentes located in Riverside County. This TELACU residential facility includes a community room and library located within their community, which serves as classroom-like settings for the learning intervention and TELACU provided us authorized access to use their available community spaces. Our community-based learning intervention was tailored to address the barriers to learning and research participation previously identified in our qualitative study: not knowing what/where to learn, transportation issues, language barriers, financial and time constraints, and low learning motivation (Rodriguez et al., 2025a; more details are provided in the methods chapter). These barriers were confirmed applicable within the TELACU Las Fuentes facility by the resident coordinators and the older adult residents.

While the initial population of focus for the proposed project was Latino older adults with a low income, when we began our collaboration with TELACU, they pointed

out that the residential facility that we are working with has a large population of Chinese individuals who would also benefit from engaging in learning English and technology. Therefore, to incorporate the needs of their community, we have also included Chinese older adults with a low income as part of the learning intervention. Both populations share commonalities in that they are racial/ethnic minoritized older adults with a low income. Moreover, they are both two of the fastest-growing groups in the U.S. (Administration for Community Living, 2024; Vespa et al., 2018). Chinese older adults with a low income face similar learning barriers to the ones identified in the qualitative study with low-income Latino older adults (Rodriguez et al., 2025a), especially given that in this situation they live within the same community and naturally share similar experiences. Throughout this dissertation, the terms *intervention* and *program* are used interchangeably to refer to the community-based learning intervention examined in this study.

Research Questions & Hypotheses

The present dissertation investigates the impact that a tailored, community-based learning intervention has among underserved older adults, specifically Latino and Chinese older adults with a low income. Utilizing a mixed-method approach, this study examines specific outcomes of learning engagement, and evaluates the implementation of the intervention based on the experiences and perceptions of participants. The research questions that this study answers and the related hypotheses are:

- **Research Question 1:** What are the effects of participating in a learning intervention on the cognition, functional independence, and well-being of underserved older adults?

Hypothesis 1: Based on the findings from previous learning intervention studies (e.g., Chan et al., 2016; Leanos et al., 2023; Shapira et al., 2007), it is hypothesized that participants will experience increases in their cognition, functional independence, and well-being.

- **Research Question 2:** How does participating in a learning intervention influence participants' learning motivation, learning self-efficacy, and aging expectations?

Hypothesis 2: Participation in the learning intervention will lead to increased motivation, higher self-efficacy, and more positive expectations regarding aging among participants.

- **Research Question 3:** What are participants' evaluations of the learning intervention based on their experience?
 - a) What are participants' perceived learning barriers and facilitators/strengths in real time?
 - b) What are participants' perceptions of the overall value, benefit, and impact of the intervention?
 - c) What aspects of the intervention could be improved in future intervention work?

Hypothesis 3: Participants may face novel learning barriers or challenges not previously identified in our preliminary study, and the barriers addressed in our

learning intervention will be identified as learning facilitators/strengths by the participants. Participants will provide high ratings of the intervention and perceive it as valuable and beneficial, but there may be aspects of the intervention or the learning content that will be discussed as needing future improvement.

CHAPTER 2

Methods

Study Design

This study utilized a within-subject design in which the same participants were measured at different time points to assess any changes in the outcomes of interest associated with their participation in a community-based learning intervention. The participants were older adults from a residential community for low-income seniors that partnered with us to conduct the intervention. The 3-month learning intervention focused on teaching Spanish-speaking and Chinese-speaking older adults 2 new skills simultaneously, English and technology, while engaging them in motivational discussion sessions. Participants completed a series of questionnaires, tasks, and interviews across 4 time points (two baselines and pre- and post-intervention assessments), providing both quantitative and qualitative data. The following subsections in this chapter describe participant demographics, the design of the intervention, study procedures, assessments used, and analytical approaches in more detail.

Participants

A total of 42 qualifying participants were initially recruited for this study, with 39 completing the intervention and related assessments (see **Figure 2**). Qualifying participants met the following requirements. First, all participants had to be residents at the TELACU Las Fuentes residential facility. Being a resident of this community encompassed having a low income and being at least 62 years of age or older. Second, individuals had to pass the General Practitioner Assessment of Cognition (GPCOG;

Brodaty et al., 2002) with a score of 5 or higher to be considered cognitively healthy for participation in the study. Alongside the GPCOG tool, interested individuals in participating had to pass the Decision Making Capacity Assessment Tool provided by our Institutional Review Board (IRB), which is used to assess the decision-making capacity of potential participants who may have or exhibit signs of cognitive impairment. Third, in order to participate, individuals had to be either a native Chinese or Spanish speaker, and have little to no English proficiency given that one of the intervention's learning skills was English. Fourth, participating individuals could not own a Samsung Tab A8 tablet device, and needed to have little to no knowledge of how to navigate it because participants were to receive this device and be taught to use it as part of the learning intervention. Fifth, participants needed to have normal vision or corrected vision by contact lenses or glasses as well as normal hearing or hearing aids to help correct any hearing impairments. Lastly, participants had to be able to physically attend and participate in the activities and scheduled classes as part of the learning intervention.

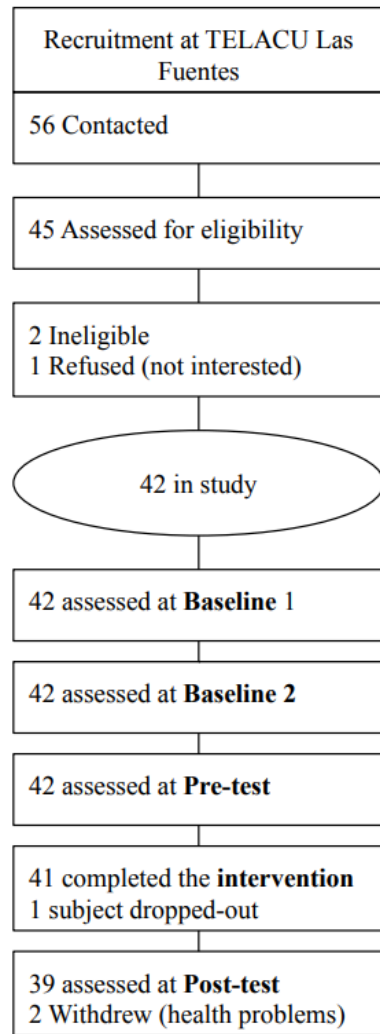


Figure 2. Flow chart of recruited and assessed participants throughout the study.

From the 39 participants who completed the intervention and assessments, ten participants (25.6%) were Spanish-speaking Latino immigrants (9 from Mexico, 1 from Honduras), and 29 participants (74.4%) were Chinese-speaking immigrants (10 from Taiwan, 19 from China). There were 29 females (74.4%) and 10 males (25.6%). Participants ranged in age from 65 to 98 years ($M_{\text{age}} = 76.67$, $SD_{\text{age}} = 7.25$). All participants reported to be retired. Participants' educational attainment ranged from 1 to

21 years ($M_{\text{education}} = 10.31$, $SD_{\text{education}} = 4.90$), with Chinese participants having significantly higher average education ($M = 11.68$) than Latino participants ($M = 6.30$), $p = 0.002$. The majority of participants reported living alone ($n = 24$; 61.5%), 13 (33.3%) lived with a spouse or partner, 1 (2.6%) lived with a family member, and 1 (2.6%) lived with a spouse/partner and a family member in the same household. In terms of marital status, 18 (46.2%) were married, 8 (20.5%) widowed, 6 (15.4%) single, 4 (10.3%) divorced, 1 (2.6%) separated, and 2 (5.1%) did not want to disclose. There was no missing data from the pool of participants who completed all intervention procedures.

Learning Intervention Design

This section explains how the learning intervention was designed. It specifically discusses the relevant theoretical frameworks used, how learning participation barriers were addressed, and how the TELACU Las Fuentes community was engaged in the intervention planning process.

The 3-month learning intervention was designed based on a previous successful intervention conducted in the lab that taught older adults multiple skills at the same time (Leanos et al., 2023). Additionally, the intervention was designed to reflect the principles of the Positive Behavior Support (PBS) framework. As mentioned in the introduction chapter, the PBS framework supports the design of interventions aimed at influencing behavior change through the modification of environmental factors or systems to enhance quality of life. In the context of designing community-based learning interventions to foster healthy aging outcomes, PBS provides guidance on how to tailor an intervention that addresses barriers to learning engagement and optimize its effectiveness. The key

principles that this framework emphasizes and that were used to design the intervention are: 1) inclusivity, 2) person-centered values, 3) a life span perspective, 4) ecological validity, 5) stakeholder participation, 6) social validity, 7) flexible implementation of multiple assessment approaches, and 8) prevention. See **Figure 3** for a visual display of how the principles of the PBS framework were embedded into the design of the learning intervention. In line with the PBS framework, the design elements presented in the figure were not only intended to reduce barriers to participation but also to promote sustained learning engagement and positive aging outcomes.

Prior to planning the intervention, we had several meetings with the TELACU community leaders and residential coordinators at the Las Fuentes facility to discuss how we could best design the intervention. We also hosted a meeting in the TELACU Las Fuentes community room to meet with the residents and gain a better understanding of their community, their learning desires, and needs. This helped us build trust with residents as it was an opportunity for them to also meet the research team, ask questions about our purpose, and learn about research. We asked residents to fill out a survey that prompted them to answer questions about their preferred language, the skills they would be interested in learning, their likelihood of wanting to participate in a learning intervention, the times and days they would be more likely to participate in learning, and their preferred method of compensation for participation. Residents were compensated for filling out the survey with a \$10 grocery store gift card. This collected information helped us tailor the intervention to this community in a direct manner. Once we had an updated design based on our conversations with the residents and other community

stakeholders, we met with the TELACU leadership team to ensure they approved and agreed with the approaches we had planned for the intervention. After approval, we met one more time with residents at TELACU Las Fuentes to share our intervention design and plan with them and openly discuss whether they had any additional suggestions and to begin recruitment of interested individuals in participating in the intervention.

Learning intervention design based on the Positive Behavior Support (PBS) framework			
1) Inclusivity	2) Person-centered	3) Life span perspective	4) Ecological validity
- Study information and learning materials are available in the primary languages of the older adults in the community (Spanish and Chinese). - Free learning tools are provided and easily accessible to all interested in participating. - All community members are welcomed to participate.	- Individual skill learning desires and barriers are assessed within the community. - Learning goals and barriers are directly addressed prior to and throughout the intervention. - Personal preferences and incentives are implemented for continued interest in intervention participation.	- Motivational sessions incorporate discussions on the importance of continued learning across the life span and encourage participants to keep on learning. - Participants keep technology devices and are taught how to look for new learning opportunities online for continued learning.	The learning intervention takes place within the community participants reside in – a real-world environment that participants are familiarized with.
5) Stakeholder participation	6) Social validity	7) Flexible assessments	8) Prevention
- The intervention design planning includes the older adult participants, the resident coordinators, and leaders within the community. - The research team holds meetings with community leaders and coordinators to discuss intervention planning and strategies.	- The older adult participants are asked to provide their feedback regarding the practicality and effectiveness of the intervention based on their experiences. - Participant and relevant stakeholder feedback is not only prompted at the end of the intervention but also throughout the duration of the study.	The impact of the intervention is assessed with multiple quantitative and qualitative methods, including cognitive tasks, questionnaires, interviews, and observational data.	- The intervention is conducted with healthy older adults with the goal of preventing future decline. - Learning engagement is viewed as a pathway for increasing positive aging outcomes and achieving healthy aging.

Figure 3. PBS principles embedded in the learning intervention design.

With the collected preliminary data and PBS framework guiding our design, our community-based learning intervention was built to mitigate identified barriers to participation for underserved older adults (Rodriguez et al., 2022). As described in the introduction, identified barriers to learning included lack of awareness regarding learning

opportunities or uncertainty about what to learn, transportation limitations, not knowing the English language at a proficient level, financial and time constraints, and low learning motivation (Rodriguez et al., 2025a). These barriers were addressed within the TELACU Las Fuentes residential community in the following ways. The lack of awareness of available learning options and opportunities was addressed by providing participants with clear guidance and structure on the classes offered. We hosted English and technology classes, which were the selected skill learning options for the intervention based on what community leaders and participants shared were skills that they needed and/or were interested in. These selected skills also align with what we found in our preliminary qualitative study, as they were the top 2 skills of interest mentioned by Latino participants (Rodriguez et al., 2025a). Transportation issues were automatically eliminated by having the intervention and all research-related procedures with participants occur within the available community rooms at the residential facility. Participants would only have to walk out of their apartment to the first floor of the building where they reside to be able to join the intervention. Language barriers were addressed by delivering the intervention and conducting all research procedures in their first language (Spanish and Chinese). Financial barriers were reduced by providing all participants with free classes and giving them the necessary learning materials at no cost (e.g., the Tablet for the technology class, notebooks, pens/pencils, backpacks; see **Figure 4**). Time constraints were also minimized as we asked potential participants to provide us with their most available times to build the intervention hours around their availability. Based on their schedules, we offered two different sessions during the week to provide flexible attendance options for participants.

Furthermore, as mentioned, we also held motivational discussion sessions to keep participants encouraged and motivated to learn throughout the learning intervention. During these motivational sessions, we provided lunch and snacks for participants (based on their preferences) to incentivize attendance and reward their learning engagement efforts.

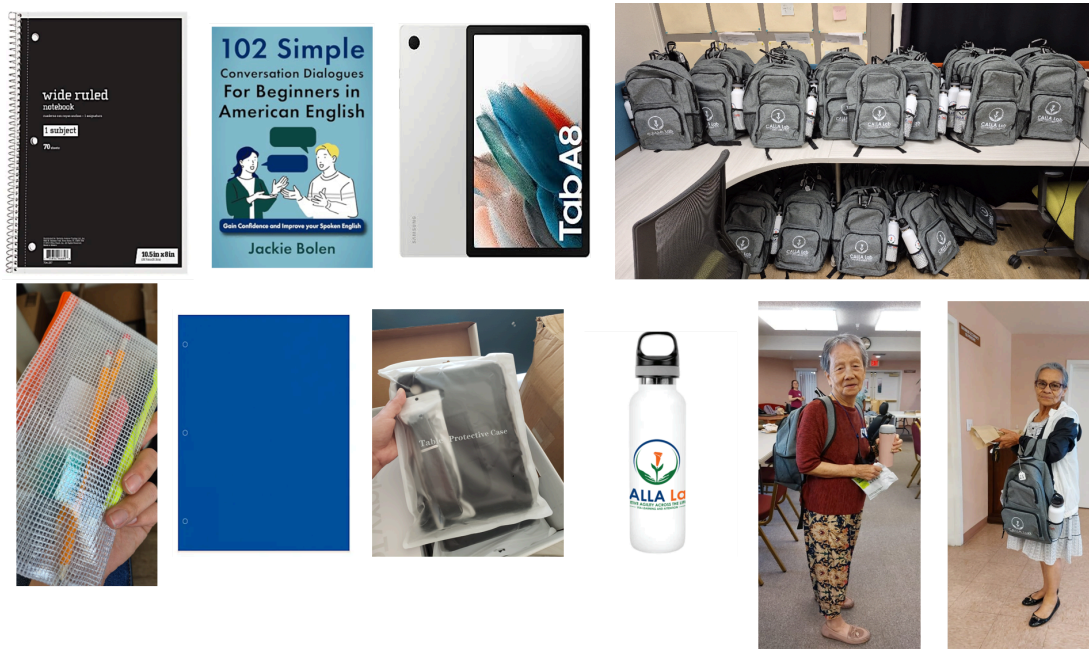


Figure 4. Learning materials provided for free to participants for English and technology classes, including a notebook, a folder, an English practice book, a pouch with supplies (e.g., pencils, pens, erasers, highlighters, sharpeners, and stylus pens), a Samsung Tab A8 tablet, a protective case, a water bottle, and a backpack.

Instructional Design

This section describes the instructional design such as the structure of the classes offered in the intervention, the scheduling, and learning dynamic.

The learning intervention offered participants English and technology classes, in addition to motivational discussion sessions (see **Figure 5** for images of participants

engaging in the intervention classes). Each class was 1 hour per week for 12 weeks. There was an orientation week (week 0), in which participants were introduced to the team, the dynamic of the classes, learning goals, and expectations for each class. During orientation, instructors and the research team explained the importance of staying in the learning program and ensured that participants felt comfortable in the classes by acknowledging that: 1) learning can feel challenging at times, 2) making mistakes is a normal part of the learning process (and mistakes are encouraged), 3) effort was valued more over accuracy, 4) the instructors and research team were there to help support them and their learning, 5) individuals are all at different levels of English proficiency and technology knowledge, 6) patience is required and afforded to everyone, 7) the team would welcome feedback on how to improve the classes and overall intervention at any time, 8) asking questions is important for learning, 9) the main goal was for them to have fun and enjoy learning, and 10) there is no age cap for learning. Participants were also encouraged to think about and write down their personal learning goals for each skill and the desired topics they wanted the instructors to cover during the classes.

Class sessions were held back-to-back within a 3-hour block each week (1 hour for technology class, 1 hour for English class, and 1 hour for the motivational discussion session). Participants were split between the two class sessions offered based on their availability (Mondays from 10:00 a.m.-1:00 p.m. or Tuesdays from 1:00 p.m.-4:00 p.m.), but they were allowed to switch sessions on any given week if they experienced time conflicts (e.g., doctor appointments). Therefore, the number of participants in each session varied weekly. However, Tuesday's session typically had a larger number of

participants each week. Given that for the majority of participants this was the first time that they were going to be engaging in formal learning since their younger years, we chose to only have each class be 1 hour once a week to avoid overwhelming participants and discouraging them from committing to the intervention. We disclosed to participants that they would need to continue learning these skills on their own after the end of the intervention if they wanted to truly master them. We emphasized that although they were not going to receive formal classes from our team in their immediate community any longer after its completion, we tailored the intervention to provide them with the tools and resources needed to help them continue learning without the need of our offered classes. For example, we taught them to use technology to search for online learning opportunities and they were able to keep the technology provided to them to do so.

Participants had to complete weekly homework assignments for the English and technology classes to help them practice what they learned in class. For in-class activities and homework, participants were asked to pair with a peer in each class to complete the assignments together with the purpose of helping and keeping each other accountable. Participants were expected to spend a weekly total of 5 to 6 hours engaged in learning (3 hours of classes plus 2-3 hours of homework and studying per week). Participants were asked to write down the amount of time they spent working on each homework assignment and/or reviewing the learning material. All homework and in-class assignments were collected to keep track of participants' engagement level in the intervention and time spent learning. Assignments and activities were not assigned grades to avoid making participants feel pressured, anxious, or discouraged based on the

evaluation of their performance. Participants were constantly reminded that their effort was what was most valued, and that their personal learning and growth in the intervention was the priority. However, correct answers for assignments were still reviewed during each class to provide feedback and clarify any confusing concepts.

Each class session had a designated instructor that used a set of presentation slides and a whiteboard to help teach and cover the topics of each week. Instructors spoke and taught in English, and because participants were Spanish and Chinese speakers, we had two main individuals who translated for participants in their language of origin. The class sessions had Latino and Chinese participants learning together. We also had a team of bilingual research assistants that acted as Teaching Assistants (TAs) to help translate and individually assist the older adults in their learning. There were a total of 4-7 TAs that spoke Chinese and 3-6 TAs that spoke Spanish. The role of the TAs was to walk around, address questions from participants, clarify instructions for them, pass out printed materials, and collect homeworks and assignments. The content from the slides presented by the instructors from each class was printed out for participants to keep, and the homework and in-class assignment instructions were always provided in the first language of participants.



Figure 5. Older adult participants at the TELACU Las Fuentes community room engaging in the learning intervention.

English Class

The English class was designed to help older adult learners gain basic listening, reading, speaking, and writing English skills. It specifically focused on improving communication skills relevant for day-to-day life interactions with peers and service providers at grocery stores, doctor offices, restaurants, and banks (see **Appendix A** for the full syllabus). Assignments typically involved completing fill-in the blank worksheets and reading conversations in English.

Technology Class

The technology class was designed following a technology learning framework on increasing technology access and literacy among underserved older adults (Rodriguez et al., 2025b). This class taught participants how to use a Samsung Tab A8 tablet. It covered

basic tablet functions and important technological skills such as how to use email, look up information online, install and use apps, online shop, request for transportation, use online banking, and access online health resources. It also taught participants how to find online learning resources to be able to continue learning even after the conclusion of the intervention. Additionally, the technology class covered important topics regarding cybersecurity and how to balance a healthy use of technology overall (see **Appendix B** for the full syllabus).

Motivational Sessions

For the motivational discussion sessions, participants were provided with lunch during the first 10 minutes of the class and learned about healthy aging practices and the importance of lifelong learning the remaining 50 minutes of class (see **Appendix C** for the full syllabus). Several topics were covered to encourage older adults to think more positively about the aging process and motivate them to continue learning without viewing their age as a limitation. We discussed age stereotypes and myths, neuroplasticity, barriers to learning engagement, learning as an older adult, theories of healthy aging, strategies for aging well (e.g., cognitive stimulation, healthy diets, exercise), and how to remain independent. For the last week of the intervention classes, our motivational discussion time was used to celebrate participants' learning accomplishments and the conclusion of the intervention. They wore a cap and gown and received a certificate of completion as well as graduation gifts, which they won by playing a raffle game (see **Figure 6**).



Figure 6. Participants celebrate the completion of the program by showing their certificates of completion and wearing their graduation cap and gown.

Procedure

Participants were recruited from the TELACU Las Fuentes residential facility located in Riverside County. Flyers were distributed by the resident coordinator to invite residents from Las Fuentes to join the research team in the community room of the facility to learn about the proposed learning intervention. We provided residents with information about the study and what their involvement would entail via a presentation in English, Spanish, and Chinese. After giving residents the presentation, they were asked to write down their name and phone number on a recruitment list if they were interested in participating. The recruited names and phone numbers were then used to contact potential participants to set up an appointment with them to walk them through the consent form and screening procedures in their first language (Spanish or Chinese).

Participation in the study included attending the classes for 12 weeks (as part of the designed learning intervention described above) and conducting the related homework assignments. Moreover, participants were asked to conduct a demographic survey, a set of cognitive tasks, questionnaires, and interviews across 4 different time points: 1) baseline 1 (2 months before the intervention classes begun), 2) baseline 2 (1 month before the intervention classes begun), 3) pre-test (right before the intervention classes begun), and 4) post-test (right after the intervention concluded). The corresponding assessments conducted within each time point are outlined in **Table 1**. The reason we included two baseline assessments was to gather two time points of cognitive data to account for any observed practice effects and because the study had a within-subjects design where participants were their own control.

Participants were compensated with a \$40 physical gift card from a grocery store of their choice (from the following options: Food for less, Grocery Outlet, Ralphs, Walmart, Target, and Trader Joe's) for each assessment time point. This form of compensation was intentionally selected to respect TELACU's rule that there be no cash interchanged within their community. The resident coordinators suggested that participants would want to be paid with physical gift cards for grocery stores. As such, to decide which grocery store gift cards to include as options for compensation, we asked the residents at TELACU Las Fuentes to share with us which stores they shopped at for groceries most often. This study was approved by the University of California, Riverside's Institutional Review Board (#30609).

Table 1. Assessment Matrix for Proposed Intervention Study					
Assessment Procedure	Time point of Assessment				
	Screening	Baseline 1	Baseline 2	Pre-test 3	Post-test 4
Participant Consent	X				
Screening questionnaire	X				
Demographic information	X				
Cognitive tasks (TabCAT + BTACT)		X	X	X	X
Functional independence (IADL + Online IADL)				X	X
Well-being (PERMA) + additional questionnaire measures				X	X
Interview questions for qualitative data				X	X
Level of learning engagement + Intervention evaluation questionnaires					X

Measures

To examine the impact that the learning intervention had on underserved older adults (Research Questions 1 and 2), our main outcome variables were: cognitive functioning, functional independence, well-being, learning motivation, learning self-efficacy, and aging expectations. Our main predictor variables measured were: time and level of engagement in the intervention. Additional variables included basic demographic information (e.g., gender, age, retirement status, years of education, marital status, etc.; see **Appendix I**), which were used as control variables in our analyses. To evaluate the overall intervention experience of participants (Research Question 3), we used participants' ratings as well as their shared views, feelings, and feedback. We employed a mixed-methods approach to measure our variables of interest (quantitative

and qualitative measures). The quantitative measures were represented by self-report questionnaires that have been validated (see **Appendix D**) and cognitive tests (see **Appendix E & Appendix F**). The self-report questionnaires demonstrated acceptable to excellent internal consistency (Cronbach's α range = .70-.98), supporting the reliability of the measures for the intended constructs in this sample. The qualitative assessments were represented by semi-structured interview protocols (see **Appendix G**) and observational data (see **Appendix H**). All measures and materials for data collection were originally created in English and were then translated into Spanish and Chinese (Mandarin).

Cognitive Functioning

Cognitive functioning was measured using two separate assessments to capture a more comprehensive evaluation of cognitive change: the Tablet-based Cognitive Assessment Tool (TabCAT; Moskowitz et al., 2016) and the Brief Test of Adult Cognition by Telephone (BTACT; Tun & Lachman, 2006). In addition to these quantitative measures, the qualitative interview asked participants to describe how they felt that their cognitive abilities were, and whether they believed the learning program had any impact on them (e.g, post-test interview question: "Do you think that the learning program has had any impact, whether positive or negative, on your mental abilities?") . Participants were asked to provide their reasoning for their responses.

TabCAT. The TabCAT measure included a series of 4 chosen cognitive tasks taken through a tablet that assesses executive function (e.g., cognitive control and working memory; Moskowitz et al., 2016). See **Appendix E** for a visual display of each task. The first task shown to participants was the *Dot Counting* task, which measures

working memory. This task presents participants with a series of screens that have blue dots, green dots, and blue squares. Participants must focus on only counting the blue dots, and then are prompted to remember the total count of blue dots they saw from each screen (in the order in which they were each presented) across six trials. Each trial increases from two to seven screens that participants are asked to recall. The second task that was shown is called *Flanker* and it measures cognitive control (inhibition skills). The Flanker task shows participants a row of five arrows in the center of the screen (the arrows can be pointing to any direction and not all arrows point the same way). Participants are supposed to focus only on the arrow in the middle and press the right or left side of the tablet screen depending on the direction that the middle arrow is pointing toward (regardless of the direction of all the other arrows). Participants are shown several trials and their job is to respond as quickly and accurately as they can. The third task that was shown is called *Running Dots*, which measures spatial working memory. It asks participants to watch a series of screens that contain a blue dot that runs around through a grid and then disappears. Participants must recall the spots (2 through 5 spots depending on the condition of the trial) where they last saw the dot appear before disappearing. This task was removed from analyses given that several participants found it to be difficult and expressed that they were randomly guessing the answers. Also, some participants were not able to pass the practice trials for this task, suggesting they had a hard time understanding instructions. The fourth task that was presented to participants is called *Set Shifting*, which also measures cognitive control. The Set Shifting task asks participants to match a stimulus that appears at the top of the screen to one of two stimuli shown in each

of the two lower corners of the screen. A word appears in the lower center of the screen prompting the participant to match the top stimuli to one of the lower corner stimuli based on either color or shape. Participants must select which stimuli appropriately matches as quickly as possible across several trials. Altogether, TabCAT took between 30-40 minutes to complete. The raw scores from each TabCAT task were standardized (into z-scores to address differences in task scaling) and then averaged to generate a composite global cognitive score.

BTACT. The BTACT assessment evaluates various cognitive abilities across 6 different tasks that can be conducted either over the phone or in person, but we chose the in-person format for this study (Tun & Lachman, 2006; see **Appendix F**). The first task was the *Rey Auditory Verbal Learning Test* (RAVLT, Lezak et al., 2012; Rey, 1964), which measures episodic memory by asking participants to listen to a list of 15 words and repeat back as many as they can recall immediately after and again after a delay. The second task was called *Digits Backward* and it measures working memory (Wechsler, 1997). This task prompts participants to repeat strings of numbers (which increase across 7 trials) in the backwards order from which they originally hear them (e.g., examiner says “6-2-9”, participant must say “9-2-6”). The third task was *Category Fluency* and it measures executive function (cognitive flexibility and language, Borkowski et al., 1967; Tombaugh et al., 1999). The Category Fluency task asked participants to name as many animals as they can think of within one minute. The fourth task was *Task-Switching, Stop and Go Task Switch (SGST)*, which is also known as the Red/Green task, and it measures attention and executive function (inhibitory control). There are three portions to this task.

First, participants must respond to the words red and green by saying “stop” when the examiner says “red” and saying “go” when the examiner says “green” as quickly and accurately as possible across 20 trials. Next, participants are asked to reverse their responses and they are now required to say “go” when they hear “red” and “stop” when they hear “green” across another 20 trials. Lastly, participants are asked to switch between normal and reverse responses when cued by the examiner across 32 trials. The fifth task is called *Number Series* (Salthouse & Prill, 1987; Schaie, 1996), which measures fluid intelligence (specifically inductive reasoning) by asking participants to complete a series of 5 numbers based on the pattern it follows by providing the final number (e.g., examiner says “18, 20, 24, 30, 38...and the next number is?” and the participant says “48” to complete the chain). The Number Series task was removed from analyses because the majority of participants had a difficult time understanding the instructions and expressed being confused about what they were supposed to do to complete the task. The final task was the *30 Seconds and Counting Task* (also known as the Backward Counting task), which requests that participants count backwards from 100 as quickly as they can within 30 seconds to see which number they are able to accurately reach. This task measures processing speed. The BTACT took between 15-20 minutes to administer. To create a composite global BTACT cognitive score, the raw scores from each BTACT task were first standardized (as z-scores to account for differences in task scaling) and then averaged.

Functional Independence

Functional independence was quantitatively measured utilizing the Instrumental Activities of Daily Living (IADL; Lawton & Brody, 1969) survey and an adapted version focused on online activities. Qualitatively, as part of the semi-structured interview, we asked participants to describe their level of independence and to share whether they believed the learning program had any impact on their independence (specifically regarding communication in English and technology use). For example, in the post-test interview, participants were asked, “Do you think that the learning program has had any impact, whether positive or negative, on your independence for communicating and understanding English?” Participants were prompted to provide their reasoning for their responses.

IADL. The IADL questionnaire measures the extent to which individuals are independent in day-to-day activities across the following categories: telephone use, shopping, food preparation, housekeeping, laundry, transportation, and medication and financial management (Lawton & Brody, 1969). Participants must select the statement that best represents their level of independence under each of these categories. For example, for the shopping category, the statement options are: 1) “Takes care of all shopping needs independently (1 point)”, 2) “Shops independently for small purchases (0 points)”, 3) “Needs to be accompanied on any shopping trip (0 points)”, and 4) “Completely unable to shop (0 points).” Scores range from 0 to 8, where a score of 0 represents a low functional level of independence and a score of 8 represents a high level of independence.

Online IADL. Utilizing the original IADL, we developed an adapted version that examines the level of independence that participants have in using relevant online tools to conduct day-to-day tasks. The online IADL includes the following categories: online shopping (groceries and/or household items), booking online transportation, online medical needs (e.g., telehealth), and online banking. Participants are categorized based on the statement that best represents how independent they are using each of these online tools. An example is the booking transportation category, which includes three statement options: 1) “Books travel arrangements independently using an online portal/application/website (1 point)”, 2) “Arranges online travel with assistance (1 point)”, and 3) “Does not book online transportation at all (0 points)” Scores range from 0 (low online independence for day-to-day tasks) to 4 (high online independence for day-to-day tasks).

Well-Being

Well-being was quantitatively measured utilizing the PERMA-Profiler questionnaire (Butler & Kern, 2016). Qualitatively, the semi-structured interview asked participants to describe how satisfied they were with life, how happy they felt, and how they felt their health was. We also asked participants to share whether they believed any of these aspects of well-being were impacted by their participation in the learning program. A sample question from the post-test interview is: “Do you think that the learning program has had any impact, whether positive or negative, on your happiness?” Participants were asked to provide their reasoning for their responses.

PERMA-Profiler. The PERMA-Profiler is a 23-item questionnaire that assesses five pillars of well-being: 1) positive emotion, 2) engagement, 3) relationships, 4) meaning, and 5) accomplishment (Butler & Kern, 2016). Sample items include “How often do you achieve the important goals you have set for yourself?” and “In general, to what extent do you feel content?” Participants were asked to respond to each item using a scale from 1 to 7. Total composite scores ranged from 23 to 161, with higher scores indicating greater well-being. Internal consistency for the PERMA-Profiler measure was good, as indicated by Cronbach’s alpha at pre-test ($\alpha = .89$) and post-test ($\alpha = .89$).

Learning Motivation

Learning motivation was quantitatively measured using the Intrinsic Motivation to Learn Scale (IMLS; Goldman et al., 2017). Qualitatively, the interview protocol prompted participants to reflect on and describe whether their motivation to learn had changed from before to after engaging in the learning intervention. In the post-intervention interview, participants were specifically asked: “Since the start of the learning program until now, do you feel that your motivation to learn new skills in general has increased, stayed the same, or decreased?” Participants were also asked to explain their answer.

IMLS. The IMLS is a questionnaire used to measure learning motivation among college students, but it was adapted in our study to specifically focus on novel skill learning (Goldman et al., 2017). It included 8 statements regarding learning new skills that participants had to rate using a scale from 1 (“strongly disagree”) to 7 (“strongly agree”). Sample statements are: “I desire to learn new skills because it gives me a sense

of fulfillment” and “It is personally satisfying for me to learn new skills.” The total possible scores range from 8 to 56, where higher scores indicate higher motivation to learn. Cronbach’s alpha indicated excellent internal consistency for the IMLS measure at pre-test ($\alpha = .90$) and post-test ($\alpha = .96$).

Learning Self-Efficacy

Learning self-efficacy was quantitatively measured with the Adult Learning Self-Efficacy Scale (ALSE; Lyndgaard et al., 2024). Learning self-efficacy was not directly measured qualitatively, although several questions in the interview protocol elicited participants’ perceptions of their learning abilities, success in the intervention, and intentions to continue learning.

ALSE. The ALSE is a multidimensional questionnaire intended to measure the learning self-efficacy of working adults who are engaged in formal learning via questions that assess self-perceived competence for learning (Lyndgaard et al., 2024). Part of the questionnaire assesses how what adults have learned can be applied to their workplace. Given that our sample is composed of retired older adults who engaged in formal learning through our intervention, we adapted the questionnaire to only include the questions that focused on their learning confidence and not the application of the skills being learned in a work environment. As such, participants were prompted to rate their confidence for a total of 17 items on a scale from 1 (“Not confident at all”) to 7 (“Completely confident”). Sample items include: “How confident are you that you can effectively divide time between the learning program and other responsibilities?”, “How confident are you that you can stay focused on what is to be learned or done?”, and “How confident are you that

you can remember new skill-related procedures after only a little practice?” The total possible score range was 17 to 119. Higher scores represent higher learning self-efficacy. Cronbach’s alpha showed excellent internal consistency for the ALSE measure at pre-test ($\alpha = .95$) and post-test ($\alpha = .98$).

Aging Expectations

Aging expectations were quantitatively measured via the 12-item Expectations Regarding Aging survey (ERA-12; Sarkisian et al., 2005b), but they were not directly measured qualitatively.

ERA-12. The ERA-12 scale is a shortened version of the Expectations Regarding Aging Survey (ERA-38; Sarkisian et al., 2002b), which is a 38-item questionnaire that measures individuals’ expectation of aging. The ERA-12 scale contains items that measure expectations regarding mental health, physical health, and cognitive function in aging (Sarkisian et al., 2005b). Participants needed to select to which extent they believed a list of 12 presented statements were true or false on a scale from 1 (“Definitely true”) to 7 (“Definitely false”). Sample statements are: “Having more aches and pains is an accepted part of aging” and “Being lonely is just something that happens when people get old.” Higher scores indicate higher aging expectations, and the total possible score ranges from 12 to 84. Cronbach’s alpha indicated good internal consistency for the ERA-12 measure at pre-test ($\alpha = .88$) and post-test ($\alpha = .92$).

Evaluation of Learning Intervention

To evaluate the learning intervention from the perspective of participants (Research Question 3), we created and administered a quantitative survey that asked

participants to rate their experience in the intervention. Qualitatively, the post-interview protocol largely focused on participants' experience in the intervention. Through the interview, we asked participants to share their perceived learning barriers and facilitators/strengths, their overall views of the impact and benefits of the intervention, and their feedback. In addition to the audio-recorded interview responses, participants constantly shared their views about the program during informal, off-audio conversations with members of the research team. These reflections were documented and considered as part of the qualitative analysis in combination with observational data.

Rating Experience in the Learning Program. At the end of the intervention, participants completed a 6-item survey that prompted participants to rate their experience in the learning program (**Appendix K**). Using a scale from 1 (“Terrible”) to 7 (“Excellent”), participants rated aspects of the program including each class, their instructors, their overall experience, and their likelihood of participating again. Sample questions included: “How would you rate your experience in the English class of the learning program?”, “How would you rate your instructor for the English class?”, “How would you rate your experience in the learning program overall?”, and “If a new set of skills were to be taught again in the future, how likely are you to participate again in the program?” Total possible scores ranged from 6 to 42. The survey demonstrated acceptable internal consistency, as indicated by Cronbach’s alpha ($\alpha = .70$). As part of the qualitative interview, participants were also asked, “How would you describe your experience in the learning program?” They were further prompted to discuss whether the

program met their initial expectations, as well as what they liked the most and least about the intervention.

Barriers and Facilitators to Learning Engagement. To gather information on the barriers and facilitators to learning that participants experienced throughout the learning program, we included questions that prompted participants to discuss these topics as part of the semi-structured interview. For example, to assess barriers or challenges, they were asked: “What things from the learning program were the most challenging or difficult for you (if any)?” and “What barriers or impediments to your engagement in learning the skills offered did you face (if any)?” To assess facilitators or strengths, the interview protocol asked participants: “What things helped you to be able to participate in the learning program?” and “What are some strengths or positive things within this community that you are a part of that helped or supported you to participate in the learning program?” Participants were also asked to discuss whether they felt supported throughout the learning program.

Perceived Impact and Benefits. The interview elicited participants’ perceptions of the impact and benefits of participating in the intervention. Specifically, participants were asked: “Do you think that your participation in the learning program has benefited you in any way?” They were prompted to describe any perceived benefits or to explain why they did not feel that the program benefited them (if applicable).

Feedback. The interview also prompted participants to provide feedback about how the learning program could be improved in the future. They were asked: “Is there anything about the learning program that you would have changed? If so, what things and

for what purpose.” Observational notes were also made by the researchers throughout the intervention about things that could be improved.

Level of Engagement in the Intervention

To measure participants’ level of engagement as a potential predictor, in addition to time point and demographic factors, we utilized self-report and observational data. There were three types of level of engagement measured: 1) researcher-tracked level of engagement, 2) hours spent learning, and 3) self-perceived engagement.

Researcher-Tracked Level of Engagement. Researcher-tracked level of engagement was measured based on a tracking sheet that was filled out weekly by the researcher who observed participants during the intervention classes (see **Appendix H**). This engagement tracking sheet served as a weekly log that tracked attendance, completion of in-class and homework assignments, and participation (e.g., asking questions to instructor, following instructions, etc.). Each section of the weekly log was scored in the following manner. Attendance for each class was scored with 2 points if a participant was present for the entire class, 1 point if a participant was late or left early, and 0 points if they were absent. Homework completion for each class was scored with 2 points if completed, 1 point if partially completed, and 0 points if not submitted. Active participation in each class was scored with 2 points if a participant asked questions, seemed attentive, and participated in the activities assigned by the instructor, 1 point if they seemed partially engaged, and 0 points if they were not engaged. Scores from each category were summed for each participant to create a total weekly engagement score (range = 0-22). These weekly total scores were added together across the 12 intervention

weeks to generate a total researcher-tracked engagement score, with the highest possible score being 264.

Hours Spent Learning. The amount of time participants spent learning in the intervention was measured by tracking participants' weekly hours spent in class (based on attendance) and reported homework hours. At the bottom of each homework assignment that was submitted, participants were asked to note down the number of hours it took them to complete it, and this information was inputted weekly into a tracking sheet. Engagement time was summed weekly and across all 12 weeks of the intervention to create a variable that represented the total number of hours each participant spent learning in the intervention.

Self-Perceived Engagement. Self-perceived engagement was measured based on participants' own perceptions of their engagement in the learning program. A self-report questionnaire was filled out at post-test by participants to reflect on the level of engagement that they had throughout the learning intervention for each skill-learning class specifically (see **Appendix J**). Sample questions from this self-report survey include: "How often did you engage in class activities for the English class?" and "How often did you ask questions during technology class on average (per class)?" Participants were asked to provide a response for each question on a scale from 1 (very rarely or never) to 7 (very often or always). Their responses were summed up to create a composite score, with higher scores representing higher self-perceived engagement (lowest possible score = 10 and highest possible score = 70). The self-perceived

engagement survey showed acceptable internal consistency, as indicated by Cronbach's alpha ($\alpha = .70$).

Quantitative Analyses

To evaluate whether any significant changes occurred across cognition, functional independence, well-being, motivation to learn, learning self-efficacy, and aging expectations, we ran individual mixed-effects regression models per outcome. Mixed-effects regression models are ideal for analyzing repeated-measures data given that they account for within-person variability and the dependence among observations (Brown, 2021; Pinheiro, 2014). These models include both fixed effects, which estimate population-level average effects, and random effects, which capture how individuals deviate from those averages. The analyses were conducted using the R software (R version 4.1.1; R Core Team, 2023).

To select the list of predictors to include in each final model, all analyses started with a saturated model that included the highest level of interaction among all appropriate predictors (e.g., age, education, gender, marital status, language). Predictors were then systematically removed to find the optimal model by using Bayesian Information Criterion (BIC) and performing Likelihood Ratio Tests (LRT) for nested models. Some predictors were selected and retained throughout the predictor-selection process (e.g., age, education level) based on theoretical and empirical reasons despite their statistical significance within the current data. Each model was run with the pre- and post-intervention time points (right before vs. right after the intervention).

Residual diagnostic checks were conducted to verify the key model assumptions of the mixed-effects models, including: 1) normality of residuals (assessed via Q-Q plots and histograms), 2) homoscedasticity (assessed via residuals vs. fitted plots), and 3) consistency of residual patterns stratified by time. The final models for each outcome are shown in the results section, all of which include a consistent set of predictor variables with interaction terms where significant. The summary tables for each model report the unstandardized coefficients, standard errors, degrees of freedom, and p-values. Significance was assessed at the 0.05 level and marginal significance at the 0.10 level. For categorical predictors, the coefficients are interpreted relative to the specified reference group (e.g., time = pre-test).

In addition to the primary mixed-effects models, we conducted supplemental analyses to evaluate for the presence of potential practice effects in the cognitive outcomes. Practice effects can commonly occur when there is repeated exposure to the same cognitive assessments, resulting in improved cognitive performance independent of any intervention effects (Bartels et al., 2010). Thus, to assess and account for any potential practice effects within our data, we ran separate mixed-effects models that included the cognitive data from all the pre-intervention time points: baseline 1 (2 months prior to the intervention), baseline 2 (1 month prior to the intervention), and pre-test (right before the intervention). In these models, baseline 1 serves as the reference group for the time variable. Examining these three pre-intervention time points allowed us to determine whether participants showed systematic improvements in cognitive performance over repeated testing before their participation in the intervention (which

would suggest practice effects) or whether any observed changes from pre- to post-intervention were more likely attributed to the intervention itself. The results from the practice effects models are presented in the results section alongside the main cognitive outcome models.

Qualitative Analyses

The audio files from the interviews were uploaded to a secure drive and assigned for transcription to bilingual research assistants whose first language aligned with their assigned interviews. Chinese-speaking research assistants first transcribed the interviews in their original language (Mandarin) and then translated the transcripts into English for analysis. Spanish-speaking research assistants transcribed the interviews from the Latino participants directly in Spanish. Translation was not required because the analysis was conducted in the original language.

The qualitative data from the post-intervention interview transcripts were analyzed utilizing a thematic analysis approach (Braun & Clarke, 2006) to assess participants' perspectives on the impact the intervention had on their cognition, functional independence, well-being, and motivation to learn as well as the evaluation of the intervention. Themes from the interviews were extracted based on participants' described outcomes, barriers, facilitators, and experiences based on the following analysis process: 1) familiarization of the data, 2) generation of codes, 3) search for themes, 4) revision of themes, 5) creation of theme definitions and names, and 6) formulation of results with quoted examples (Braun & Clarke, 2006). The data was analyzed using an inductive strategy (Thomas, 2003), where patterns based on

participants' responses were identified and guided the creation of a codebook, as opposed to generating a pre-determined codebook and then applying it to the data. Where appropriate, themes were corroborated or enriched with observational data from field notes collected by researchers who monitored and supervised the intervention and data collection process. Integrating these observations offered a deeper understanding of participants' experiences and provided additional context and insights to support the qualitative findings.

A total of 30 interview transcripts were included in the qualitative analyses, including all 10 interviews from the Latino group and 20 out of 29 interviews from the Chinese group. Descriptive statistics were calculated to provide demographic context for the participants whose qualitative data were analyzed. Among the 10 Latino participants, the average age was 75 years ($SD = 8.63$; range = 68–98). The majority were female ($n = 9$, 90.0%), with one male participant ($n = 1$, 10.0%). Latino participants reported an average of 6.3 years of education ($SD = 3.09$; range = 1–12). Among the 20 Chinese participants, the average age was 77.1 years ($SD = 7.62$; range = 65–90). The Chinese subsample included 13 females (65.0%) and 7 males (35.0%). Chinese participants reported an average of 11.3 years of education ($SD = 4.67$; range = 2–21).

The initial selection of 20 Chinese interviews for in-depth qualitative analysis was based on the availability of transcribed and translated data at the time, guided by data saturation principles and the goal of achieving a representative yet manageable dataset for rigorous thematic analysis. These 20 interviews captured the full range of experiences, perspectives, and key patterns relevant to the study's research questions. Once the

remaining 9 Chinese interview transcripts become available, they will be reviewed to confirm that thematic saturation was indeed reached.

The Latino and Chinese participant interview data were initially analyzed separately to respect the cultural and contextual differences in participants' experiences and perspectives. Given that Latinos and Chinese participants had different backgrounds and educational histories, analyzing the data separately helped prevent potentially missing subtle differences in their perceived experience and avoid overgeneralization. Separate analysis allowed the research team to capture culturally specific nuances and preserve each group's unique perspectives. After conducting separate analyses to identify patterns and group-specific themes, the findings were compared. Mirrored themes were merged while similarities and differences within each theme across groups were noted. Themes that were unique to each group were separately retained. This method facilitated cross-group comparisons, highlighting shared outcomes and perspectives while identifying culturally distinct experiences, enhancing the validity and interpretative richness of the findings.

Upon generating the final codebook from the separate analyses, a trained analysis team individually applied the codebook to the interview transcripts, keeping track of whether each theme was present or absent across participants' responses using a binary system (1 = theme present, 0 = theme absent). The coded data from all team members were compiled in a spreadsheet to identify consistencies and discrepancies in theme application. The binary coded data were then uploaded to R to conduct interrater reliability analyses, which indicated a high level of agreement regarding the application

of all the identified themes among team members (average $k = 0.86$; Cohen, 1960). Any discrepancies were discussed by the analysis team until consensus was reached, ensuring that theme application was accurate and consistent among all analyzed interviews. To further validate findings, the quantitative results and qualitative themes were presented to the participating community to confirm that the findings were representative of their experiences and accurately captured their voices.

Positionality Statement

As a Latina immigrant from Mexico with a close relationship with the Latino older adult community, I conducted this research with the intention of increasing positive aging outcomes among older adults who are often underrepresented in research (with a special focus on low-income, Latino older adults). As a native Spanish speaker who has experienced language barriers in the past, I was motivated to include Spanish-speaking participants and other individuals who speak languages other than English into research to enrich the current literature in this area of work with more diverse voices and experiences. Given the cross-cultural nature of the study, Spanish and Chinese bilingual research assistants were also involved in the transcription, translation, and interpretation of the interview data to help ensure linguistic and cultural accuracy in the analytic process.

While I cannot directly relate to the lived experiences of older adults as a younger individual, I have gained valuable insights from older adult relatives, participants from my previous and current research, and the aging literature and courses I have taken on the topic as a scholar. Throughout the research process, I remained mindful of how my

background and perspective could influence data interpretation. I also had a high willingness to learn from my participants and acknowledge that I need to continue developing and strengthening my expertise. Although I led the data analysis from this project (along with the research assistants whom I trained), I discussed my findings with the community I worked with to corroborate the final results.

CHAPTER 3

Quantitative Results on Cognition, Functional Independence, and Psychosocial outcomes

This chapter presents the quantitative findings that examine the impact of participating in a tailored, community-based learning intervention among Latino and Chinese older adults with a low income. Specifically, it addresses the following research questions: 1) What are the effects of participating in a learning intervention on the cognition, functional independence, and well-being of underserved older adults? and 2) How does participating in a learning intervention influence participants' learning motivation, learning self-efficacy, and aging expectations? Prior research has demonstrated that learning engagement can lead to improved cognition, functional independence, and well-being in older adults (Chan et al., 2016; Leanos et al., 2023; Shapira et al., 2007). However, these studies have been conducted with more privileged populations, limiting the generalizability of these findings to underserved older adult populations (e.g., low-income, racial/ethnic minoritized older adults). Moreover, there is a need for more learning interventions with older adults to study learning motivation, learning self-efficacy, and aging expectations as potential psychosocial outcomes of learning engagement, as opposed to primarily studying them as predictors of engagement (e.g., Breda & Watts, 2017; Chang & Lin, 2011; Phipps et al., 2013).

To examine changes across the outcomes of interest, individual linear mixed-effects regression models were conducted per outcome using the R software (R version 4.1.1; R Core Team, 2023). Each model incorporated the pre- and

post-intervention time points (time 3 and 4). Predictors were selected based on theoretical considerations and model fit indices (e.g., BIC and LRT). All models included random intercepts for participants. Model assumptions were evaluated using residual diagnostic checks: 1) normality of residuals (assessed via Q-Q plots and histograms), 2) homoscedasticity (assessed via residuals vs. fitted plots), and 3) consistency of residual patterns stratified by time. For each model, unstandardized coefficients, standard errors, degrees of freedom, and p-values are reported in summary tables, with significance evaluated at the 0.05 level and marginal significance at the 0.10 level.

The predictors for each model included: time point (pre-test as the reference group), self-perceived engagement in the intervention ($M = 58.05$, $SD = 9.00$, range = 38–70), age ($M = 76.67$, $SD = 7.25$, range = 65–98 years), and educational attainment ($M = 10.31$, $SD = 4.90$, range = 1–12 years). Interaction terms were tested and included in the models when statistically significant. The descriptive statistics for each outcome variable at pre- and post-intervention time points are presented in **Table 2**.

In addition to self-perceived engagement, participants demonstrated variability in their overall level of participation in the intervention. Participants spent between 26.67 to 116.75 hours engaged in the intervention ($M = 47.72$, $SD = 15.64$) and researcher-tracked participation scores ranged from 138 to 260 ($M = 226.21$, $SD = 36.16$). However, these variables were not included as predictors in the final models because they demonstrated weaker predictive value relative to participants' self-perceived engagement.

Table 2*Descriptive Statistics (Mean, Standard Deviation, and Range) for Each Outcome**Variable (N = 39)*

Outcomes	Pre-intervention			Post-intervention		
	<i>M</i>	<i>SD</i>	Range	<i>M</i>	<i>SD</i>	Range
BTACT global cognition (z)	0.09	0.70	-1.43–1.55	0.16	0.75	-1.59–1.61
TabCAT global cognition (z)	-1.49	1.65	-5.49–1.63	-1.42	1.77	-6.43–1.88
Processing speed	29.74	13.31	9–67	33.05	15.95	5–67
Working memory	17.38	6.24	1–27	16.23	6.24	5–27
Cognitive control (z)	-2.27	1.96	-6.17–1.32	-2.11	2.20	-8.08–1.70
Functional independence	6.56	1.80	2–8	7.00	1.54	2–8
Online independence	1.00	1.38	0–4	2.00	1.45	0–4
Well-being	116.23	16.58	80–160	120.33	16.12	83–155
Learning motivation	51.18	4.73	36–56	51.64	5.65	36–56
Learning self-efficacy	82.90	16.31	54–119	90.85	23.54	34–119
Aging expectations	37.95	11.74	20–65	43.00	15.96	15–81

Note. For BTACT and TabCAT global cognition and cognitive control, the means and standard deviations are reported in z-score units because individual tasks were standardized and averaged together to create composite scores for these outcomes.

Cognitive Outcomes

Cognition was assessed using the BTACT and TabCAT measures, each consisting of a series of tasks that captured performance across different cognitive domains. For the main analyses, composite global scores for both the BTACT and TabCAT measures were created. In addition, because prior literature emphasizes the impact of learning engagement on specific cognitive domains (Bugos & Wang, 2022; Chan et al., 2016; Leanos et al., 2023), processing speed, working memory, and cognitive control were also analyzed separately. Processing speed was measured using the BTACT Backward Counting task, working memory was assessed using the TabCAT Dot Counting task, and cognitive control was calculated as the average from the TabCAT Flanker and Set Shifting tasks.

To account for potential practice effects, separate linear mixed-effects analyses were conducted using cognitive data from all pre-intervention time points: baseline 1 (2 months before the intervention), baseline 2 (1 month before the intervention), and pre-test (right before the intervention). Baseline 1 was used as the reference group in these analyses. Practice effects analyses help determine whether participants showed improvements in their cognitive abilities due to repeated testing prior to participating in the learning intervention to distinguish between practice-related changes and intervention-related gains. These models are presented alongside each main cognitive outcome model below.

BTACT Global Cognition

The results of the practice effects model for BTACT global cognition are shown in **Table 3**. The linear mixed-effects analysis indicated that participants experienced significant improvements in BTACT global cognition from baseline 1 to baseline 2 ($b = 0.147$, $SE = 0.062$, $p = 0.021$) and from baseline 1 to pre-test ($b = 0.293$, $SE = 0.062$, $p < 0.001$). Additionally, education positively predicted BTACT global cognition scores ($b = 0.068$, $SE = 0.017$, $p < 0.001$), such that participants with higher educational attainment had higher cognitive scores across pre-intervention assessments. Age showed a negative but nonsignificant association ($b = -0.017$, $SE = 0.011$, $p = 0.146$). These results suggest that there are practice-related improvements in BTACT global cognition prior to starting the learning intervention.

Table 3.

Results of the Practice Effects Model for BTACT Global Cognition.

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i>-value
Time 2 (baseline 2)	0.147	0.062	76	0.021**
Time 3 (pre-test)	0.293	0.062	76	< 0.001**
Age	-0.017	0.011	36	0.146
Education	0.068	0.017	36	< 0.001**

Note. b = unstandardized coefficient; SE = standard error; df = degrees of freedom; reference group for time was baseline 1 (time 1); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$); results are reported in z-score units.

The results from the model assessing pre- to post-intervention changes in BTACT global cognition are reported in **Table 4**. The linear mixed-effects model revealed that time ($b = 0.062$, $SE = 0.061$, $p = 0.317$), self-perceived engagement ($b = 0.015$, $SE = 0.011$, $p = 0.173$), and age ($b = -0.022$, $SE = 0.013$, $p = 0.092$), were not significant predictors of BTACT global cognition. However, there was a significant time x self-perceived engagement interaction ($b = 0.016$, $SE = 0.007$, $p = 0.022$), indicating that participants with higher engagement experienced greater improvements in BTACT global cognition from pre-test to post-test than participants with lower engagement. Education was also a significant positive predictor, with higher educational attainment associated with higher BTACT global cognition scores ($b = 0.056$, $SE = 0.020$, $p = 0.008$).

Table 4.

Results of the Linear Mixed-Effects Model for BTACT Global Cognition.

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	0.062	0.061	37	0.317
Engagement	0.015	0.011	42	0.173
Age	-0.022	0.013	35	0.092*
Education	0.056	0.020	35	0.008**
Time 4 x Engagement	0.016	0.007	37	0.022**

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$); results are reported in z-score units.

TabCAT Global Cognition

The practice effects model results for TabCAT global cognition are displayed in **Table 5**. The results show that there is a significant effect of time on TabCAT global cognition as scores increased from baseline 1 to baseline 2 ($b = 0.375$, $SE = 0.185$, $p = 0.046$). Time was a marginally significant predictor of TabCAT global cognition scores from baseline 1 to pre-test ($b = 0.347$, $SE = 0.185$, $p = 0.064$). Age and education were both significantly associated with TabCAT global cognition. More specifically, older participants tended to have lower scores ($b = -0.077$, $SE = 0.028$, $p = 0.010$), and participants with higher educational attainment had better scores ($b = 0.161$, $SE = 0.042$, $p < 0.001$). These findings indicate that there are modest practice-related improvements in TabCAT global cognition prior to the intervention, especially between baseline 1 and baseline 2.

Table 5.

Results of the Practice Effects Model for TabCAT Global Cognition.

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i>-value
Time 2 (baseline 2)	0.375	0.185	76	0.046**
Time 3 (pre-test)	0.347	0.185	76	0.064*
Age	-0.077	0.028	36	0.010**
Education	0.161	0.042	36	< 0.001**

Note. b = unstandardized coefficient; SE = standard error; df = degrees of freedom; reference group for time was baseline 1; * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$); results are reported in z-score units.

The main model examining pre- and post-intervention TabCAT global cognition scores revealed several significant predictors of cognitive performance (see **Table 6**). Self-perceived engagement was a significant positive predictor, indicating that participants with higher engagement in the intervention had higher TabCAT global cognition scores ($b = 0.054$, $SE = 0.025$, $p = 0.037$). Higher education also significantly predicted better TabCAT global cognition scores ($b = 0.121$, $SE = 0.046$, $p = 0.013$). Time ($b = 0.075$, $SE = 0.134$, $p = 0.582$) and age ($b = -0.054$, $SE = 0.031$, $p = 0.085$) were not significantly associated with TabCAT global cognition scores. However, there was a significant interaction between time and age ($b = -0.042$, $SE = 0.019$, $p = 0.033$), suggesting that the effect of age on TabCAT global cognition differed between assessment time points. Older participants exhibited smaller gains in TabCAT global cognition from pre-test to post-test compared to younger participants.

Table 6.

Results of the Linear Mixed-Effects Model for TabCAT Global Cognition.

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	0.075	0.134	37	0.582
Engagement	0.054	0.025	35	0.037**
Age	-0.054	0.031	42	0.085*
Education	0.121	0.046	35	0.013**
Time 4 x Age	-0.042	0.019	37	0.033**

Note. b = unstandardized coefficient; SE = standard error; df = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$); results are reported in z-score units.

Processing Speed

The practice effects model results for the cognitive domain of processing are presented in **Table 7**. There was no significant change in processing speed scores from baseline 1 to baseline 2 ($b = -0.359$, $SE = 1.133$, $p = 0.752$), and there was a marginally significant increase from baseline 1 to pre-test ($b = 2.103$, $SE = 1.133$, $p = 0.067$). Age was not significantly associated with processing speed scores ($b = -0.075$, $SE = 0.224$, $p = 0.739$). Higher educational attainment was associated with higher processing speed ($b = 1.352$, $SE = 0.332$, $p < 0.001$). These findings indicate that there are minimal practice-related effects for processing speed across pre-intervention assessments.

Table 7.

Results of the Practice Effects Model for Processing Speed.

Predictor	b	SE	df	Unadjusted p-value
Time 2 (baseline 2)	-0.359	1.133	76	0.752
Time 3 (pre-test)	2.103	1.133	76	0.067*
Age	-0.075	0.224	36	0.739
Education	1.352	0.332	36	< 0.001**

Note. b = unstandardized coefficient; SE = standard error; df = degrees of freedom; reference group for time was baseline 1 (time 1); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

The results from the main model examining changes in processing speed from pre-test to post-test are shown in **Table 8**. Time was a significant positive predictor, indicating that processing speed improved from pre-test to post-test ($b = 3.308$, $SE = 1.385$, $p = 0.022$). Although self-perceived engagement was not a significant predictor on its own ($b = 0.088$, $SE = 0.242$, $p = 0.717$), the interaction between time and self-perceived engagement was significant ($b = 0.426$, $SE = 0.156$, $p = 0.009$). Participants with higher engagement experienced greater improvements in processing speed from pre-test to post-test than those with lower engagement. Educational attainment was also significantly associated with processing speed, with higher education predicting higher processing speed scores ($b = 1.318$, $SE = 0.425$, $p = 0.004$). The main effect of age was not significant ($b = -0.065$, $SE = 0.270$, $p = 0.810$).

Table 8.

Results of the Linear Mixed-Effects Model for Processing Speed.

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	3.308	1.385	37	0.022**
Engagement	0.088	0.242	43	0.717
Age	-0.065	0.270	35	0.810
Education	1.318	0.425	35	0.004**
Time 4 x Engagement	0.426	0.156	37	0.009**

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

Working Memory

The results from the practice effects model for the cognitive domain of working memory are reported in **Table 9**. Working memory showed marginally significant changes from baseline 1 to baseline 2 ($b = 1.590$, $SE = 0.861$, $p = 0.069$), and a statistically significant increase from baseline 1 to pre-test ($b = 2.436$, $SE = 0.861$, $p = 0.006$). Education positively predicted working memory scores ($b = 0.598$, $SE = 0.148$, $p < 0.001$), whereas age was not a significant predictor ($b = -0.105$, $SE = 0.100$, $p = 0.302$). These findings suggest that practice-related improvements in working memory are present across pre-intervention assessments.

Table 9.

Results of the Practice Effects Model for Working Memory.

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 2 (baseline 2)	1.590	0.861	76	0.069*
Time 3 (pre-test)	2.436	0.861	76	0.006**
Age	-0.105	0.100	36	0.302
Education	0.598	0.148	36	< 0.001**

Note. b = unstandardized coefficient; SE = standard error; df = degrees of freedom; reference group for time was baseline 1 (time 1); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

The main model evaluating changes in working memory from pre-test to post-test is displayed in **Table 10**. Time ($b = -1.154$, $SE = 0.732$, $p = 0.123$) and age ($b = -0.137$, $SE = 0.093$, $p = 0.149$) were not significant predictors of working memory scores. In

contrast, self-perceived engagement significantly predicted working memory ($b = 0.196$, $SE = 0.079$, $p = 0.018$), such that higher engagement was associated with better performance. Education was also a significant positive predictor ($b = 0.628$, $SE = 0.146$, $p < 0.001$), with higher educational attainment associated with higher working memory scores.

Table 10.

Results of the Linear Mixed-Effects Model for Working Memory.

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	-1.154	0.732	38	0.123
Engagement	0.196	0.079	35	0.018**
Age	-0.137	0.093	35	0.149
Education	0.628	0.146	35	< 0.001**

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

Cognitive Control

Table 11 presents the results of the practice effects model for the cognitive control domain. Results indicated that there was a significant increase in cognitive control scores from baseline 1 to baseline 2 ($b = 0.467$, $SE = 0.213$, $p = 0.031$). There was a marginally significant change in cognitive control from baseline 1 to pre-test ($b = 0.390$, $SE = 0.213$, $p = 0.070$). Age was a significant negative predictor of cognitive control scores ($b = -0.111$, $SE = 0.037$, $p = 0.005$), indicating that older participants had lower scores than

younger participants. Education was significantly and positively associated with cognitive control scores ($b = 0.169$, $SE = 0.055$, $p = 0.004$). These results suggest that there are practice-related improvements in cognitive control prior to the intervention.

Table 11.

Results of the Practice Effects Model for Cognitive Control.

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 2 (baseline 2)	0.467	0.213	76	0.031**
Time 3 (pre-test)	0.390	0.213	76	0.070*
Age	-0.111	0.037	36	0.005**
Education	0.169	0.055	36	0.004**

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was baseline 1 (time 1); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$); results are reported in z-score units.

The main model assessing changes in cognitive control from pre-test to post-test is shown in **Table 12**. Time ($b = 0.155$, $SE = 0.192$, $p = 0.423$) and educational attainment ($b = 0.091$, $SE = 0.060$, $p = 0.138$) were not significant predictors of cognitive control. Age was a significant negative predictor ($b = -0.100$, $SE = 0.038$, $p = 0.014$), indicating that older participants had lower cognitive control scores than younger participants. The association of self-perceived engagement with cognitive control was marginally significant ($b = 0.062$, $SE = 0.032$, $p = 0.063$).

Table 12.*Results of the Linear Mixed-Effects Model for Cognitive Control.*

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	0.155	0.192	38	0.423
Engagement	0.062	0.032	35	0.063*
Age	-0.100	0.038	35	0.014**
Education	0.091	0.060	35	0.138

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$); results are reported in z-score units.

Functional Independence Outcome

The results of the linear mixed-effects model examining functional independence (IADL) are reported in **Table 13**. Time was a significant positive predictor ($b = 0.436$, $SE = 0.214$, $p = 0.048$), indicating that participants' IADL scores improved from pre-test to post-test. Age was negatively associated with functional independence, with older participants showing lower scores than younger participants ($b = -0.083$, $SE = 0.030$, $p = 0.008$). Higher educational attainment predicted higher functional independence ($b = 0.107$, $SE = 0.047$, $p = 0.028$). Self-perceived engagement in the intervention did not significantly predict IADL scores ($b = 0.011$, $SE = 0.025$, $p = 0.663$).

Table 13.

Results of the Linear Mixed-Effects Model for Functional Independence.

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	0.436	0.214	38	0.048**
Engagement	0.011	0.025	35	0.663
Age	-0.083	0.030	35	0.008**
Education	0.107	0.047	35	0.028**

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

Online Functional Independence Outcome

Table 14 presents the results from the linear mixed-effects model evaluating changes in online functional independence (online IADL). The analysis revealed that participants experienced significant improvements in online IADL scores from pre-test to post-test ($b = 1.000$, $SE = 0.168$, $p < 0.001$). Age was significantly and negatively associated with online functional independence ($b = -0.072$, $SE = 0.027$, $p = 0.011$), such that older participants had lower online IADL scores than younger participants. Self-perceived engagement ($b = 0.004$, $SE = 0.023$, $p = 0.869$) and educational attainment ($b = 0.067$, $SE = 0.042$, $p = 0.122$) were not significant predictors of online IADL.

Table 14.*Results of the Linear Mixed-Effects Model for Online Functional Independence.*

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	1.000	0.168	38	< 0.001**
Engagement	0.004	0.023	35	0.869
Age	-0.072	0.027	35	0.011**
Education	0.067	0.042	35	0.122

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

Well-Being Outcome

The linear mixed-effects model results assessing changes in well-being are displayed in **Table 15**. Participants showed a marginal increase in well-being from pre-test to post-test ($b = 4.103$, $SE = 2.141$, $p = 0.063$). Age was a significant negative predictor of well-being, with older participants having lower scores than younger participants ($b = -0.912$, $SE = 0.307$, $p = 0.005$). Neither self-perceived engagement ($b = 0.266$, $SE = 0.260$, $p = 0.313$) nor education ($b = -0.768$, $SE = 0.483$, $p = 0.121$) significantly predicted well-being.

Table 15.*Results of the Linear Mixed-Effects Model for Well-Being.*

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	4.103	2.141	38	0.063*
Engagement	0.266	0.260	35	0.313
Age	-0.912	0.307	35	0.005**
Education	-0.768	0.483	35	0.121

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

Learning Motivation Outcome

The learning motivation results from the linear mixed-effects model are presented in **Table 16**. Motivation to learn did not significantly change from pre-test to post-test ($b = 0.462$, $SE = 1.106$, $p = 0.678$). However, self-perceived engagement in the intervention significantly and positively predicted learning motivation ($b = 0.131$, $SE = 0.066$, $p = 0.050$), as higher engagement was associated with higher motivation. Both age ($b = -0.202$, $SE = 0.078$, $p = 0.012$) and education ($b = -0.317$, $SE = 0.122$, $p = 0.012$) were significant negative predictors of learning motivation, suggesting that older participants and those with higher education had lower learning motivation scores.

Table 16.*Results of the Linear Mixed-Effects Model for Learning Motivation.*

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	0.462	1.106	73	0.678
Engagement	0.131	0.066	73	0.050**
Age	-0.202	0.078	73	0.012**
Education	-0.317	0.122	73	0.012**

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

Learning Self-efficacy Outcome

The linear mixed-effects model results for learning self-efficacy are shown in **Table 17**. Learning self-efficacy scores significantly increased from pre-test to post-test ($b = 7.949$, $SE = 3.089$, $p = 0.014$). Age ($b = -0.876$, $SE = 0.370$, $p = 0.024$) and educational attainment ($b = -1.202$, $SE = 0.581$, $p = 0.046$) were significant negative predictors, indicating that older participants and those with higher education reported lower learning self-efficacy. Self-perceived engagement was not significantly associated with learning self-efficacy ($b = 0.494$, $SE = 0.313$, $p = 0.124$).

Table 17.*Results of the Linear Mixed-Effects Model for Learning Self-Efficacy.*

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	7.949	3.089	38	0.014**
Engagement	0.494	0.313	35	0.124
Age	-0.876	0.370	35	0.024**
Education	-1.202	0.581	35	0.046**

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

Aging Expectations Outcome

Table 18 presents the results from the linear mixed-effects model for aging expectations. Scores for aging expectations were significantly higher at post-test compared to pre-test ($b = 5.051$, $SE = 1.695$, $p = 0.005$). Self-perceived engagement in the intervention ($b = 0.302$, $SE = 0.244$, $p = 0.225$), age ($b = -0.361$, $SE = 0.288$, $p = 0.219$), and education ($b = 0.205$, $SE = 0.453$, $p = 0.654$) were not significant predictors of aging expectations.

Table 18.*Results of the Linear Mixed-Effects Model for Aging Expectations.*

Predictor	<i>b</i>	<i>SE</i>	<i>df</i>	Unadjusted <i>p</i> -value
Time 4 (post-test)	5.051	1.695	38	0.005**
Engagement	0.302	0.244	35	0.225
Age	−0.361	0.288	35	0.219
Education	0.205	0.453	35	0.654

Note. *b* = unstandardized coefficient; *SE* = standard error; *df* = degrees of freedom; reference group for time was pre-test (time 3); * = marginally significant ($0.05 < p < 0.10$); ** = statistically significant ($p < 0.05$).

Chapter 3 Summary

To evaluate the impact of the learning intervention on the cognition, functional independence, well-being, and other psychosocial outcomes among underserved older adults, a series of independent linear mixed-effects regression models were conducted. Practice-related effects were assessed for cognitive measures across pre-intervention time points to account for potential improvements as a result of repeated testing. Practice effects analyses revealed that there were marginally to statistically significant improvements in cognitive performance prior to the start of the intervention. The main models for all outcomes focused on changes from pre-test to post-test.

In terms of cognitive outcomes, results showed that participants with higher engagement in the intervention experienced greater cognitive gains from pre-test to post-test, as reflected by the significant interaction between time and self-perceived

engagement for the BTACT global cognition model. Older participants had smaller cognitive gains from pre-test to post-test than younger participants based on the significant interaction between time and age for the TabCAT global cognition model. Participants with higher engagement also had higher TabCAT global cognition, working memory, and cognitive control scores. Processing speed significantly increased from pre-test to post-test, and participants with higher engagement also experienced greater improvements.

For functional independence outcomes, participants demonstrated significant improvements from pre-test to post-test, for both IADLs and online IADLs. Regarding psychosocial outcomes, learning self-efficacy and aging expectations also significantly improved from pre-test to post test, whereas well-being scores marginally improved and learning motivation scores did not significantly change. However, participants with higher engagement in the intervention had higher learning motivation scores.

Across models, age and education were frequently significant predictors. Older age was associated with lower cognition (BTACT global cognition, TabCAT global cognition, and cognitive control), functional independence, well-being, learning motivation, and learning self-efficacy. Education positively predicted BTACT global cognition, TabCAT global cognition, processing speed, working memory, and functional independence outcomes. Interestingly, higher educational attainment was significantly associated with lower learning motivation and learning self-efficacy scores.

In sum, the results suggest that the learning intervention was associated with measurable changes across multiple outcomes. A detailed interpretation of these findings

is provided in the Discussion (Chapter 6). The following chapter (Chapter 4) presents the qualitative findings on the same outcomes of interest that were examined quantitatively in this chapter, providing additional insight into participants' lived experiences and perspectives.

CHAPTER 4

Qualitative Themes on Cognition, Functional Independence, and Psychosocial Outcomes

Chapter 4 presents the qualitative findings from the post-intervention interviews conducted with the Latino and Chinese participants addressing the impact of their participation in the tailored, community-based learning intervention across the following outcomes: cognition, functional independence, learning motivation, and learning self-efficacy (Research Questions 1 and 2). An inductive, thematic analysis approach was utilized to identify themes on experienced outcomes directly based on participants' narratives. Given the differences in cultural background between Latino and Chinese participants, the interview data were analyzed separately at first. This approach captured group-specific nuances and culturally distinct experiences, and cross-group comparisons. Themes that were mirrored across both groups were merged while still noting similarities and differences, and unique themes were retained to represent each group's perspectives.

The identified themes are organized across each of the outcomes of interest that we wanted to examine from the perspective of participants. The themes are described with example quotes. Themes are first introduced based on the similarities between the Latino ($n = 10$) and Chinese ($n = 20$) groups, followed by discussing notable differences within each theme, and concluding with a description of how the themes relate to the quantitative results from Chapter 3. We employed a convergent parallel mixed-methods design, which helps compare, relate, and interpret results from quantitative and qualitative data that were collected simultaneously (Creswell & Clark, 2007; 2017). To

present the qualitative themes on the outcomes of interest in relation to the quantitative data findings, we used a table as a joint display to help visualize the integration of both types of data (Guetterman et al., 2015). Individual tables per outcome display the themes from participants' experiences alongside the quantitative findings from Chapter 3, including the endorsement percentage from the Latino and Chinese groups as well as corresponding quotes that exemplify the themes. The interviews represent the perceived experiences of 30 participants (10 Latinos and 20 Chinese; see Chapter 2 for demographics information). Interrater reliability analyses for the themes reported in this chapter demonstrated a high level of agreement among the raters (average $k = 0.90$; Cohen, 1960).

Cognition Theme

Participants reflected on their cognitive abilities during the interviews and were asked to describe whether their mental abilities or capacity, defined as the brain's ability to remember, focus, pay attention, think, and perform other functions, had been impacted as a result of their participation in the intervention. One prominent theme emerged from their responses and was endorsed by 23 of the 30 participants (76.7%): An awakening of the mind and memory through stimulating engagement.

An awakening of the mind and memory through stimulating engagement

Participants discussed cognitively benefiting from participating in the learning intervention. Both Latino (100.0%; 10 out of 10) and Chinese (65.0%; 13 out of 20) participants reported experiencing an increase in their memory, information processing, and overall cognitive capacity through actively "using" and "exercising" their brain as

they learned. For example, one Latino participant shared, “[my cognitive abilities] have changed in that I can now remember more things.” Similarly, Chinese participants said, “I’ve noticed a big improvement, especially in my memory. My recall has gotten better...I feel my thinking has opened up.” Another Chinese participant stated, “I think it has had a good impact, it makes me think more. I remember that I have to go to class, and I have to remember to do my homework today.”

Both groups emphasized that the program opened up their thinking and pushed their brain to work through the stimulating engagement of learning new skills, which contributed to strengthening their minds and increasing mental agility. A Latino participant said, “I am thinking and working my brain, so I feel good because I am doing something that strengthens my mind.” Chinese participants similarly highlighted brain stimulation and how the mind “has to process the information” it receives. One participant expressed, “My brain has been stimulated...because I’ve been studying, doing homework, and attending classes, so my thinking has been stimulated, so I feel like I’ve become more agile, my brain is a little more flexible.” These shared experiences suggest that participants perceived learning activities that required active recall and cognitive effort as anecdotally helpful in enhancing their memory and thinking abilities.

While there were a lot of similarities in how participants discussed the impact of learning on their cognitive abilities, there were some differences in how they framed these experiences. Latino participants specifically framed learning as something that “awakened” their mind, often expressed through the phrase “my mind woke up”. One participant said, “I feel that it woke my mind up more to have it be active and not let it

fall asleep...to remember more things...and I do not want to let it just fall asleep.” They also discussed feeling more alert and gaining the capacity to “absorb more information”. A Latino participant metaphorically described feeling that “there was something oxidized” in their mind, and that this learning program helped reverse that “oxidation”. On the other hand, Chinese participants framed the impact of learning more in terms of building mental resilience (e.g., “My mental resilience has improved!”).

Connection to cognitive quantitative findings: The presented theme of *an awakening of the mind and memory through stimulating engagement* aligns closely with the quantitative findings on cognitive outcomes (see **Table 19**). Despite not finding uniform significant changes from pre-test to post-test in global cognition, participants who reported higher engagement in the learning intervention demonstrated greater scores in BTACT and TabCAT global cognition, processing speed, and working memory. This convergence suggests that actively engaging in cognitively stimulating activities, as described by participants, may help explain the pattern of engagement-related gains observed in the quantitative analyses. In other words, participants’ subjective experiences of “exercising” their minds and improving memory through active engagement are supported by the quantitative results, which show how self-perceived engagement significantly predicted cognitive gains.

Importantly, participants’ perceptions of cognitive improvement may reflect real-world, day-to-day experiences that are not fully captured by standardized cognitive assessments. Participants described noticing improvements in their memory and mental agility within the context of everyday activities, such as remembering class schedules,

completing homework, or engaging in mentally stimulating tasks, rather than through researcher-generated tasks. This potential discrepancy between subjective experiences and lab-based measures underscores the value of including qualitative data to capture real-world changes in cognition that occur outside the limitations of lab-based testing. In sum, participants' narratives provide insights into the effect that the intervention had on their daily cognitive functioning, complementing the findings that highlight engagement-related gains.

Table 19.

Integration of Cognitive Quantitative Outcomes and Qualitative Themes

Quantitative		Qualitative	
Cognitive outcomes	Theme	% of endorsement	Quotes
• Global BTACT: Time x Engagement ($b = 0.016$, $p = 0.022$) • Global TabCAT: Engagement ($b = 0.054$, $p = 0.037$) • Processing speed: Time ($b = 3.308$, $p = 0.022$); Time x Engagement ($b = 0.426$, $p = 0.009$) • Working memory: Engagement ($b = 0.196$, $p = 0.018$) • Cognitive control: Engagement ($b = 0.062$, $p = 0.063$)	<i>An awakening of the mind and memory through stimulating engagement</i> This theme represents participants' experiences of perceived cognitive benefit from the intervention, describing improvements in memory, mental agility, and processing ability.	Latinos: 100.0% (10/10) Chinese: 65.0% (13/20)	Latinos: "I feel that [learning] woke my mind up." "I feel that my memory opened up." Chinese: "My memory has improved." "When you participate in this learning process, at least you're learning. Even if you don't understand something, it still pushes your brain."

Note. Time = pre-test to post-test changes; Engagement = self-perceived engagement in learning; percentages represent endorsement within each cultural group.

Functional Independence Theme

As part of the interview protocol, participants were asked to reflect on their level of independence in using English and technology, and whether the program had any impact on that independence. The majority of participants reported experiencing improvements in their independence with English and/or technology as a result of participating in the intervention (90.0%; 27 out of 30). Gains in independence were reported more frequently for technology use (90%; 27 out of 30) than for English skills (80%; 24 out of 30). One overarching theme emerged from the data: Growth in English and technology skills as a pathway to increased independence in daily life.

Growth in English and technology skills as a pathway to increased independence in daily life

Participants described developing their English and technology skills in ways that enhanced their sense of independence and personal agency. Both Latino (90.0%; 9 out of 10) and Chinese (90.0%; 18 out of 20) participants reported being able to use English and/or technology more independently to manage daily life tasks with reduced reliance on others. Beyond skill acquisition, participants emphasized the practical value of what they learned, describing how English and technology skills could be directly applied to everyday contexts (e.g., “we can apply what we learn.”). These skills were often framed as convenient and essential tools for navigating daily life and maintaining independence. Participants reported actively integrating what they learned into their routines beyond the classroom, making their learning feel impactful in real-world settings.

Technology-related independence was frequently described in terms of accessing online resources, completing online tasks, and engaging in entertainment. Many participants reported downloading apps, practicing English through language-learning platforms such as Duolingo, using Zoom to connect with family members (e.g., “I can now Zoom with my granddaughter.”), and independently using online banking and shopping websites such as Amazon. Technology also emerged as a new source of entertainment, with participants describing how they had begun listening to music, watching videos, and exploring online content on their own. In some cases, participants described using technology to access community resources that previously felt out of reach. For example, a Latino participant shared that she was able to obtain free vegetables through the Riverside County Office on Aging after independently navigating the organization’s website to locate the resource. She expressed pride in accessing this online benefit portal independently, stating enthusiastically, “I did it online and I did it by myself!”

Latino participants discussed moments in which they saw how the skills they had learned had come in handy for their independence. One participant shared that when she went to a community center and wanted to inquire about their services, she encountered someone who told her, “I don’t speak Spanish”, and she responded, “It’s ok, talk in English to me, no problem,” and proceeded to have a conversation in English, which was something that surprised her and made her feel good. Another participant described no longer needing a friend to order items online for her: “Before, I had a friend that would order me things online that I wanted and then she would send them to me. Now, it is

easier for me to order them myself via Amazon and I can send things directly to my grandkids.” Reflecting on the importance of these skills for everyday life, one participant explained, “[These skills] are very helpful for those of us in older age, they are things that we need to get by every day. Wherever you go, you need English and technology.”

Chinese participants expressed similar sentiments, describing how the program helped them develop practical English and technology skills that supported their daily functioning. As one participant stated, “Things I could not do before, I can now do online,” while another shared, “I didn't know anything about tablets before...after the tablet teacher explained things, I can now basically master the use of various functions.” Improvements in English were also described as increased comfort with speaking and understanding the language. One participant noted, “My spoken English seems to have improved too...I feel like I communicate a bit faster than before; that's a very positive effect.” Another explained how the program helped reduce their fear of speaking English: “The teacher taught us pronunciation and computer skills, things I couldn't do before. They guided us step by step. It's been immensely beneficial...now when someone speaks English to me, I can respond, especially in English. When people talk to me in English, I can answer fairly fluently. I don't stumble or hesitate much anymore. It used to be intimidating, I was too scared to speak at all.”

Chinese participants also described how these newly acquired skills translated into practical applications in everyday contexts. One participant explained, “It makes my life smoother, for example, dealing with things in English, going to the doctor, it's more convenient...communicating at the bank, helping people with things.” Another

participant emphasized the practicality and necessity of these skills for navigating daily life: “I gained a clearer understanding of things I didn't know before. For example, things like ordering food at a restaurant, going to the bank to open an account, and writing checks. I feel these are all very good and practical things for daily life. Although I haven't mastered them, I know these things are very useful...these are all necessary skills that we must master now.”

Both groups also emphasized the combined use of English and technology as a key mechanism for increased autonomy. Technology served as a bridge for English communication, particularly through translation tools and language-learning applications (e.g., Duolingo). Although participants from both groups discussed integrating technology and translation tools to support English use, Chinese participants provided more detailed accounts of applying these tools. A Chinese participant explained, “Learning English through technology has been very helpful for my English improvement...I can now translate what I want to say in English using the tablet, and then I can communicate with people.” Another Chinese participant described resolving a housing maintenance issue independently by translating a message on their tablet rather than having to rely on their daughter for help: “My garbage disposal unit broke down, I couldn't write or say what was wrong. So, I wrote it in Chinese, translated it using the tablet, and then I showed it to the manager, and she fixed it for me. Otherwise, I wouldn't be able to say it. I needed my daughter's help, but she didn't have time to help me, so I solved it myself.” A third participant provided a specific example of using translation tools learned in the program to communicate independently with a doctor: “Yesterday, I

used computer translation to write to the doctor. I needed the doctor to prescribe some medicine, and I also had a lot of pain. It was very serious, and I needed the doctor to prescribe painkillers...After the computer translated it, I felt that this computer and English learning was very helpful and practical.”

Overall, participants emphasized that learning these skills reduced their dependence on others and, in some cases, enabled them to assist others instead. One participant shared how she could see the impact and importance of the skills she was learning as, “First, you don't have to ask for help. Second, you can help others.” Several expressed that the ultimate goal of their learning was to become “totally independent” and “not ask anyone for help”.

Latino participants also described independence more broadly, extending beyond skill acquisition. Several noted that participating in the program motivated them to be more physically and socially active, which had a positive impact on their physical agility. As one participant stated, “I feel much more physically agile, if it weren't for this, I would have just been in bed all these days or months without moving much and complaining about everything,” suggesting that engagement in learning encouraged greater mobility and engagement initiative. In one case, a participant whose daughter served as her caregiver described how the program empowered her to advocate for greater independence at home. Because her daughter accompanied her to classes and was exposed to discussions emphasizing the importance of autonomy, she began allowing her mother to take on more tasks independently. The participant expressed excitement that, as a result of the program, her daughter was now intentionally encouraging her to do more

on her own rather than completing tasks for her. Another Latino participant highlighted her desire to remain actively involved in tasks rather than relying on family members: “I don’t want them to do it for me, I want them to explain it to me...if I make a mistake, I can just start over.” This statement shows a sense of agency and willingness to engage actively in tasks rather than deferring them to others.

There were minor differences between groups for this theme. However, Chinese participants generally expressed greater independence in the application of newly acquired technology skills in practical contexts, particularly in supporting English communication, through more detailed examples. Latinos uniquely highlighted the impact of the intervention in motivating greater mobility and more strongly emphasized their growing independence and desire to become even more self-sufficient as they progressed in their learning. Nonetheless, both groups acknowledged that they still needed assistance in some situations and recognized room for continued improvement (e.g., “sometimes I still have to ask others for help”).

Connection to the quantitative findings on functional independence: The qualitative theme of *growth in English and technology skills as a pathway to increased independence in daily life* aligns with the quantitative findings on functional independence (see **Table 20**). The linear mixed-effects regression models indicated significant improvements in functional independence from pre-test to post-test, indicating measurable gains in functional independence over time. These improvements are consistent with the practical and real-world skills learned as part of the intervention, which were directly applicable to participants’ everyday functioning. In the same vein,

online functional independence demonstrated significant improvements from pre-test to post-test, reflecting participants' increased ability to complete technology-based tasks independently. These quantitative findings converge with participants' narratives describing greater independence in using English and technology to navigate everyday responsibilities without relying as much on others.

Table 20.

Integration of Functional Independence Quantitative Outcomes and Qualitative Themes

Quantitative		Qualitative	
Functional independence outcomes	Theme	% of endorsement	Quotes
● IADL: Time ($b = 0.436$, $p = 0.048$) ● Online IADL: Time ($b = 1.000$, $p < 0.001$)	<i>Growth in English and technology skills as a pathway to increased independence in daily life</i> This theme reflects participants' experiences of increased independence through the development of English and technology skills, describing greater autonomy in skill-related tasks with reduced reliance on others. It emphasizes the real-world practicality of the skills learned and how participants applied these skills in their daily life to be more independent.	Latinos: 90.0% (9/10) Chinese: 90.0% (18/20)	Latinos: "Learning helps us better ourselves every day and to not depend on others. " "I have learned technology and how to better pronounce words in English that I did not know how to pronounce before." "I learned how to download apps!" Chinese: "It's useful, I don't have to rely on others." "I feel that...my [English and technology] abilities have improved a lot compared to before." "I didn't need [my

			son] to explain anymore; I could translate things myself using my phone.” “I think both skills are very practical, because we use them in our daily lives.”
--	--	--	---

Note. IADL = Instrumental activities of daily living; Time = pre-test to post-test changes; percentages represent endorsement within each cultural group.

Well-Being Themes

Participants were prompted to discuss whether their participation in the intervention impacted different domains of well-being, including their happiness, mental/physical health, and life satisfaction. Three themes emerged from the data: 1) Learning as a driver of purpose, fulfillment, and positive emotion (96.7%; 29 out of 30), 2) Learning as an escape from isolation and everyday struggles (50.0%; 15 out of 30), and 3) Feeling youthful through intergenerational learning (10.0%; 3 out of 30).

Learning as a driver of purpose, fulfillment, and positive emotion

As participants reflected on their experiences in the intervention, they described learning as a meaningful and worthwhile activity that fostered a sense of purpose, personal fulfillment, and positive emotion. This theme was widely endorsed across both Latino (100.0%; 10 out of 10) and Chinese (95.0%; 19 out of 20) participants. Learning was consistently framed as something that provided direction, structure, and intentional use of time during later life.

In terms of purpose, participants emphasized that the program gave them something valuable to do and invest their time in, while also helping to combat boredom in their day-to-day lives. A Latino participant expressed appreciation for having their time “spent on something to improve” themselves. Another shared, “[Learning] is very good for us. Even though we’re already older people, it’s important to learn something new and not just sit around bored looking at each other. It’s very enjoyable.” Learning made them feel useful: “It is a motivation to not feel like one can no longer do anything, that one is useless...learning is very necessary.” Similarly, Chinese participants described

learning as a purposeful alternative to inactivity. One participant noted that the program gave them “something to do when you have nothing else to do,” while another stated, “during class time we can learn things instead of just lying around...you can at least make use of your time.” A Chinese participant further explained that there were typically few opportunities for engagement within their residential community, and that the program provided something meaningful to focus on: “Because we have nothing to do here, so it's better to learn more things...I like to learn more things, otherwise it's too boring here...because the more I know, the less bored I am at home, and I can use what I've learned in my daily life.” Across both groups, learning was viewed as more than a passive pastime; it was framed as a productive, active, and enriching pursuit that increased engagement with daily life. Beyond simply structuring their time, participants characterized learning as cultivating hope and strengthening their sense of purpose. One Chinese participant reflected, “This gives seniors a new course, a new hope...because if you don't have a hope in your life, if you don't have a focus, if you don't have a new project to learn, your retirement life will often become increasingly lazy and indolent.” This reflection illustrates how participants perceived learning as a protective factor against passivity and disengagement in later life. The intervention provided not only activity, but also a sense of direction and continued growth.

In addition to purpose and productivity, participants described experiencing heightened positive emotions as a result of engaging in learning. Chinese participants explained feeling happiness and enjoyment. One participant shared, “After learning new things, I feel very happy and energetic throughout the day,” and another stated, “Learning

makes me happy; it's so enjoyable. Learning throughout life, using what you learn, makes a difference in your mood. It's great to be learning again...I like the process; it provides education for the elderly and makes me feel happy. My mood is quite good.” Participants also described improvements in their overall mental state. As one Chinese participant shared, “I'm happier...my mental state is better,” and another noted, “my mental state and interest level have also improved...I have more things that make me happy.” Several participants also talked about experiencing an increase in their life satisfaction. One Chinese participant shared, “This program has greatly increased my [life] satisfaction,” and another explained, “Because I'm learning things that I can use in my life, I'm even more satisfied [in life].” Latino participants did express similar sentiments, stating, “I feel more at ease, I feel happier,” and “we are happy and satisfied.” These comments suggest that learning was pleasurable and fostered an uplift in mood that benefited their emotional well-being.

Chinese participants explicitly linked their positive mood to perceived physical health benefits. A Chinese participant shared, “Learning makes me happy, and a good mood has a positive impact...a cheerful mood is good for your health...learning more, being healthy, I'm quite satisfied with my life. I look at the computer, chat with people, and I feel pretty good.” Another expressed, “My health comes from believing in happiness...You're healthy only when you're happy. The Bible says joy is the best medicine for health.” These narratives illustrate how some Chinese participants conceptualized emotional well-being and physical health as interconnected, with learning serving as a bridge for both.

Beyond experiencing emotional uplift, participants also described feeling fulfilled and accomplished as a result of learning, with these sentiments emerging more prominently among Latino participants. For many Latinos, fulfillment was framed not simply as satisfaction with the program, but as the realization of a lifelong dream that had previously felt unattainable. Participants described longstanding educational aspirations that were interrupted by structural barriers, including limited access to schooling, economic hardship, and the demands of immigration and labor that left little time for formal learning. Several Latino participants reflected on how the program allowed them to reclaim aspirations they had carried since childhood. One shared, “I accomplished my...what I carried with me since I was a little girl, that desire to go to school, and yes it had an impact, I feel fulfilled...my saying has always been that I have to do something important during the day so that when I go to bed, I can analyze what I did and say that I did something good and worthwhile.” Another expressed the deeply personal significance of continuing to pursue her dream of learning English: “I loved it, and for me, how can I say it? It is like pushing myself to keep on going...and practicing to achieve my big dream [of speaking English well]...I am getting there, I don’t want to die without learning. Speaking English fluently has been my big dream since I was young...And I think I would die peacefully and at ease if I achieve it.” These narratives reflect learning as an opportunity to fulfill lifelong goals that had been postponed and experience a sense of wholeness later in life.

Learning also fostered feelings of completeness through the acquisition of skills participants perceived as essential. As one Latino participant stated, “This experience was

very useful because I did not know anything about technology, nothing! Now that you all have taught me, well, now I feel a little more complete.” In this way, fulfillment was tied to lifelong aspirations and to the development of practical competencies. In contrast, Chinese participants did not describe fulfillment in terms of lifelong or unrealized dreams. However, one participant did articulate a strong sense of accomplishment associated with newly gained independence. The participant reflected on successfully scheduling a medical appointment in English: “For example, today at 3:30, the doctor called me, and I had tried to make an appointment myself by phone before. I used some simple words, and even though I spoke slowly, the other person understood me, which gave me a great sense of accomplishment.” This account suggests that, for some Chinese participants, fulfillment was more closely tied to task-specific mastery and functional achievement.

In distinguishing differences between groups, although both Latino and Chinese participants endorsed learning as a source of purpose and positive emotion, the emphasis and framing of these experiences varied. Chinese participants more frequently highlighted productivity and emotional uplift, describing learning as contributing to improved mood, cheerfulness, and hopefulness. Several also explicitly connected positive mood to physical health, suggesting an integrated view of emotional and bodily well-being. For many Chinese participants, fulfillment was closely tied to task-specific accomplishment and growing independence. Learning was framed as a productive alternative to “doing nothing,” reinforcing usefulness and purpose in later life. On the other hand, Latino participants placed a stronger emphasis on fulfillment in relation to the

achievement of lifelong learning dreams. For several, the program represented an opportunity they had never imagined they would attain, particularly in older adulthood: “You can’t imagine the sense of well-being, because I had been waiting for this class for years. I used to say, ‘Where can I go? And when I was told that I could have this [learning] possibility here, well, I was super happy.” Learning was described as something they were unable to pursue earlier in life due to educational barriers, immigration-related hardships, and work demands. Achieving these goals later in life led participants to describe feeling more complete, whole, and satisfied.

Learning as an escape from isolation and everyday struggles

Both Latinos (80.0%; 8 out of 10) and Chinese (35.0%; 7 out of 20) participants experienced the learning intervention as a form of relief and an escape from confinement, social isolation, psychological distress, and physical discomfort. For several Latino participants, the program represented an opportunity to step outside what they described as “las cuatro paredes” (“the four walls”), a phrase symbolizing physical confinement and stagnation within their apartments. Participants reflected on how remaining within those walls limited personal growth and led to isolation. One participant explained: “Honestly, for us older people, being here in the apartments is comfortable, but these four walls don’t help us grow stronger in our day-to-day lives. What really strengthens us is seeing other people, especially people like you who come to motivate us. When one focuses on the people...I forget about everything that is on the outside. For me, truly, this has been a very good experience.” This narrative highlights the perception that growth requires exploration outside the home. The program provided a structured reason to leave their

apartments and engage with others. Another Latino participant shared: “If you just stay at home locked up, you don’t do anything or learn anything. That’s what I think. Sometimes during the week there are two or three days when I don’t go out at all, not even to check the mail. But when Monday comes, I’m there, ready.” Chinese participants similarly described feeling “stuck at home” and viewed learning as an escape: “Learning a new skill is so important for the elderly. Because if you don't learn, you're stuck at home. You don't know anything, and you can't go out.”

While both groups referenced confinement, Chinese participants more strongly emphasized the program’s role in reducing loneliness. Several described the emotional benefits of interaction and connection. A Chinese participant stated, “Seeing you makes us happy. Talking with you makes us happy. If you're an elderly person living alone, it's not good. Elderly people need to talk to you often to be happy. You bring us happiness, you cheer us up...it's better if children visit often so we don't feel so lonely.” Another participant contextualized their loneliness within the living environment for older adults and shared how this program helped reduce such emotions through the engagement opportunities it offered them: “I'm rather lonely here, it's quite lonely in the senior living community. But now, through this learning program, I've made many friends. So, we often participate in the organized outings, like going shopping at the supermarket. Through these activities, I've met many people. Before, I stayed indoors a lot and rarely went out.”

Aside from confinement, isolation, and loneliness, participants described the program as interrupting cycles of negative thinking and emotional decline. For some, the

intervention arrived during periods of vulnerability in their life. One Latino participant reflected: “This program came at a time when—when I was going through days where my situation wasn’t very good; I was almost falling into depression...I thought I was going to be shut inside four walls...I became depressed and everything. Then the program came... I was listened to, and so I feel it arrived at just the right time for me.” Another participant who struggled with chronic depression shared that preparing for class and completing homework assignments helped keep her thoughts away from sadness. Chinese participants similarly described how concentrating on learning pushed away negative thinking: “I feel very happy. Because I don't think about other things; I'm always thinking about how to answer this question, and when I learn to translate, I'm there translating. Sometimes I spend a long time translating.” Learning worked as a tool to redirect attention away from distressing thoughts and toward purposeful cognitive activity.

Some participants felt that the relief they experienced was beyond their emotional states. Latino participants described how focusing on learning helped them momentarily forget about aches and pains associated with physical health problems. As one discussed, being mentally engaged meant they were “occupied with something more” and therefore less aware of bodily discomfort. Chinese participants echoed this experience, with one participant explaining how their pain is relieved when engaged in learning: “Yes, when I'm learning, I don't feel the pain. When I'm learning, I focus my attention on studying, so I don't notice the pain.” Participants’ narratives suggest that learning not only provided emotional distraction but also relief from physical discomfort.

Although Latino and Chinese participants described learning as offering emotional and physical relief through engagement and distraction, the emphasis and framing of this “escape” differed across groups. Latino participants more frequently portrayed the intervention as liberation from physical confinement and emotionally difficult circumstances within the home. Learning was described as a break from “las cuatro paredes,” providing relief from daily stressors, stagnation, and, in some cases, depressive symptoms. In contrast, Chinese participants more often framed learning as protection against loneliness and social isolation. While some described distraction from negative thoughts and health-related pain, they primarily talked about the importance of interpersonal interaction brought to them by the program. Participation was valued as an opportunity for connection, conversation, and shared activity within their community.

Feeling youthful through intergenerational learning

This theme uniquely captures Chinese (15.0%; 3 out of 20) participants’ experiences of the program fostering a sense of youthfulness through intergenerational interaction. This theme only emerged among Chinese participants and it specifically reflects how engagement with younger individuals contributed to participants feeling emotionally and socially rejuvenated. Participants described how interacting with and the presence of younger people generated positive emotions and made them feel younger: “It makes me feel a bit younger!”. One participant stated, “I’m very happy to see you young people...interacting with young people makes older people feel younger.” Another participant shared, “Talking with you all makes us happy, like we’re young again. So you should come often.” These reflections suggest that participants’ perception of

youthfulness was not just about chronological age but about the social atmosphere they experienced through the program. Being in the presence of younger individuals evoked feelings of happiness and youthfulness. For participants residing in communities primarily composed of older adults, the intergenerational component of the program offered a refreshing contrast to their usual social environment.

Connection to the quantitative findings on well-being: These qualitative findings provide important context for interpreting the quantitative changes observed in well-being (see **Table 21**). Although the linear mixed-effects model indicated only a marginal increase in well-being from pre-test to post-test, participants' narratives reveal experienced shifts in purpose, emotional uplift, fulfillment, and relief from physical and emotional distress as well as isolation. These described changes may not be fully captured by standardized measures. The identified themes suggest that well-being gains were experienced across various and specific domains. This interpretation aligns with well-being quantitative findings, which, although modest in magnitude, trended in a positive direction.

Table 21.

Integration of Well-Being Quantitative Outcomes and Qualitative Themes

Quantitative		Qualitative	
Well-being outcomes	Theme	% of endorsement	Quotes
Well-being PERMA: Time ($b = 4.103$, $p = 0.063$)	<i>Learning as a driver of purpose, fulfillment, and positive emotion</i> This theme captures participants' experiences of learning as a meaningful and worthwhile activity that fostered a sense of purpose, personal fulfillment, and enhanced positive emotional well-being.	Latinos: 100.0% (10/10) Chinese: 95.0% (19/20)	Latinos: "I took it as something that filled me up...I felt complete...doing something that I did not get to do when I was younger." "I feel happier thanks to this program." Chinese: "It gives me something to do. Otherwise, I'd just be idle at home." "It makes me happy, it gives me something to look forward to."
	<i>Learning as an escape from isolation and everyday struggles</i> This theme represents participants' experience of the learning intervention	Latinos: 80.0% (8/10) Chinese: 35.0% (7/20)	Latinos: "Going to class every time is super nice...if it weren't for you, I would not get up, I would be laying there crying, but look at how happy I am!"

	as an emotional, mental, and physical escape from confinement, isolation, negative situations, and daily hardships.		Chinese: “For these elderly people, if you don't learn, you're stuck at home, unaware of the world outside. Even if bullets are coming, you're still stuck at home. Learning is essential. You absolutely must learn. If you learn, you'll step out.”
	<i>Feeling youthful through intergenerational learning*</i> This theme refers to Chinese participants’ experience of the program fostering a sense of youthfulness through engagement in learning with younger generations.	Chinese: 15.0% (3/20)	Chinese: “I feel very happy (laughs), as if I've become younger myself.”

Note. Time = pre-test to post-test changes; * = unique theme found only among the Chinese group; percentages represent endorsement within each cultural group.

Learning Motivation Theme

The interview protocol asked participants to reflect on whether their motivation to learn new skills had increased, stayed the same, or decreased. The majority of participants reported experiencing an increase in their motivation, with only 3 participants out of 30 (10.0%) stating that it remained the same for them. Among those who reported an increase in motivation (90.0%; 27 out of 30), one key theme emerged: From claimed to embodied motivation: Uncovering a greater desire for continued learning.

From claimed to embodied motivation: Uncovering a greater desire for continued learning

This theme represents participants' increased motivation to continue learning beyond the program. Both Latino (100.0%; 10 out of 10) and Chinese (85.0%; 17 out of 20) participants described that engaging in the learning program sparked a stronger desire and inspiration to continue learning. Many expressed noticing a clear shift in their motivation from before to after completing the program. A Latino participant shared, “Notice that I feel different, I feel more motivated... even though I’ve always been positive with myself...but I feel very motivated.” Another stated, “I’ve become very motivated, and I would like to keep learning new things...it has really motivated me.” One participant specifically discussed how their motivation to learn was also driven by having access to learning materials: “I want to keep practicing, doing what I could not do before now that I have the material to do it, and that way, I can continue to learn more.” Similarly, Chinese participants described that their “motivation to learn has increased.”

One participant explained, “I’m more motivated to learn, I’m interested, and I’m willing to learn new knowledge.”

Participants also emphasized a desire for continued learning beyond the program itself. A Latino participant shared, “I’d like to keep learning instead of staying stuck in the same place, to learn more so that my brain grows stronger and I can keep doing well.” Another reflected, “It awakened my desire to keep searching and learning. I have set a goal for myself, I want to learn English...I’ll keep on learning.” Chinese participants similarly highlighted a developed desire for learning, particularly after realizing how much more there was to learn. As one participant said, “Because once I learn one thing, I want to learn another. Why? Because knowing one thing but not another feels incomplete.” Another Chinese participant shared, “I’m eager to learn things; even if I make mistakes, I’ll figure them out. I want to learn more.”

For some participants, increased motivation to learn was driven by a desire to help others. A Latino participant described wanting to continue learning technology “to help others” and “support other older adults that sometimes cannot leave their homes.” Another expressed, “I want to keep practicing so that I can share with friends who don’t know about technology or English and be able to help them in the future.” Chinese participants echoed this sentiment. One shared, “I just want to continue learning...I want to be a translator, to help people solve problems, for example, to have barrier-free conversations with Americans. But I’m not good enough yet, so I want to learn more.” These reflections suggest that motivation to learn was in part connected to contributing to others.

There were substantial similarities in how Latino and Chinese participants described their increased motivation. No notable differences emerged between the groups, as both expressed a strengthened desire to continue learning for similar reasons, including personal growth and the aspiration to help others.

Connection to the quantitative findings on learning motivation: The qualitative theme on learning motivation helps contextualize the quantitative findings (see **Table 22**). The quantitative findings on learning motivation showed no statistically significant change from pre-test to post-test. Motivation scores remained high across time points, highlighting that participants entered the program already viewing themselves as motivated learners. However, their narratives suggest that the intervention did not simply maintain motivation, it activated and clarified it. Participants frequently described a realization or awakening of desire to continue learning, indicating a shift from claiming themselves as “motivated” individuals abstractly to a more embodied and future-oriented expression of that motivation. In other words, although quantitative scores did not significantly increase, participants described a qualitative transformation in how their motivation was experienced, reporting that their desire to learn felt stronger and more activated after participating in the program than when they first began their participation. This interpretation is further supported by the finding that self-perceived engagement significantly predicted learning motivation, suggesting that participants who felt more involved in the program also reported stronger motivation. Taken together, these findings suggest that the intervention may have helped participants discover a deeper level of learning motivation than they initially believed was present.

Table 22.

Integration of Learning Motivation Quantitative Outcomes and Qualitative Themes

Quantitative		Qualitative	
Learning motivation outcomes	Theme	% of endorsement	Quotes
Motivation: Time ($b = 0.462$, $p = 0.678$); Engagement ($b = 0.131$, $p = 0.050$)	<i>From claimed to embodied motivation: Uncovering a greater desire for continued learning</i>		Latinos: “I have a motivation now that I never had before...even though I’m an older person, it has really motivated me.”
	This theme reflects participants’ increased motivation to continue learning beyond the program. Although many initially believed they were already motivated, participation in the program helped them recognize and embody a deeper commitment to continued learning.	Latinos: 100.0% (10/10) Chinese: 85.0% (17/20)	“Until I die, you will see me with a backpack hanging from my back!” Chinese: “This program motivated me to learn actively, encouraged me to learn, which is great.” “I’ll keep learning until I die.”

Note. Time = pre-test to post-test changes; Engagement = self-perceived engagement in learning; percentages represent endorsement within each cultural group.

Learning Self-Efficacy Theme

Although the interview protocol did not include questions that directly assessed learning self-efficacy, participants raised this topic organically during the interview conversations. Seven participants (23.3%; 7 out of 30) described experiences of increased confidence in their learning abilities. One theme emerged from these narratives: Learning engagement as proof of capability: “If I can do this, I can do more!”

Learning engagement as proof of capability: “If I can do this, I can do more!”

This theme uniquely captures Latino participants’ experiences of strengthened self-efficacy through engagement in the learning intervention and a change in mindset (70.0%; 7 out of 10). Participants described how completing learning tasks served as tangible proof that they were still capable of learning in older adulthood. The program reinforced, and in some cases, restored their belief in their own abilities, particularly their ability to learn. Participants experienced a shift in mindset, moving away from doubt and fear about their capacity to learn at their age and realizing that they were able to accomplish learning. Successfully accomplishing learning tasks fostered a sense of confidence and pride in their own capabilities, as a participant shared, “You all made me realize that I...that I can still do things. Yeah, that brought me so much satisfaction, to see that I can still do it.” Another participant highlighted, “I’ve learned to feel confident, to feel happier and proud of myself. Because I tell myself, ‘I can do it!’ That’s why I want to keep learning.”

Participants explicitly emphasized the shift in mindset they experienced regarding their self-efficacy. They spoke about the role of the learning program in helping them

acknowledge their overall capacity and challenge their earlier assumptions that they were “too old” to learn. A participant described, “Now I think more positively instead of negatively, like, ‘Oh, I can’t do that. I’m not going to learn that. I’m too old to do that.’ Now I’ve changed. I really liked the class, honestly... I want to learn more... Yeah, because before, I was afraid to press things on the tablet with the pen...I used to do it with fear, but now I just go for it.” Similarly, another participant expressed: “I used to say, ‘How am I going to learn at my age? No.’ And then, oh! It awakened my mind! I realized there’s no age limit for learning...it made me so happy, as an older adult, to see that we can do it, and that we can keep learning. It’s not just for young people; it’s for anyone who wants to learn.” Together, these narratives suggest that learning engagement served as evidence of capability. For these Latino participants, the program not only increased their motivation but also strengthened their belief that they were competent learners in later life.

Connection to the quantitative findings on learning self-efficacy: The qualitative theme of learning engagement as proof of capability aligns closely with the quantitative findings for learning self-efficacy (see **Table 23**). The linear mixed-effects model indicated a statistically significant increase in learning self-efficacy from pre-test to post-test, suggesting that participants reported greater confidence in their ability to learn following the intervention. The Latino participants’ narratives provide depth to this statistical change, illustrating how successful engagement in learning tasks served as concrete evidence of their capability. Their descriptions of shifting from doubt (“I’m too

old to learn”) to confidence (“I can do it”) anchor the type of change in self-belief captured in the quantitative increase.

Table 23.

Integration of Learning Self-Efficacy Quantitative Outcomes and Qualitative Themes

Quantitative		Qualitative	
Learning self-efficacy outcomes	Theme	% of endorsement	Quotes
• Self-efficacy: Time ($b = 7.949$, $p = 0.014$)	<i>Learning engagement as proof of capability: “If I can do this, I can do more!”*</i> This theme reflects participants’ experiences of gaining a greater sense of confidence in their ability to learn through their participation in the learning intervention. Having successfully engaged in learning served as tangible proof that they remained capable learners in older adulthood and contributed to a shift in mindset.	Latinos: 70.0% (7/10)	Latinos: “I feel that if I can do this, I can do more. It’s a motivation that makes you feel capable. You feel like you’re learning...like you’re still young enough to learn, that your mind can still work well.”

Note. Time = pre-test to post-test changes; * = unique theme found only among the Latino group; percentages represent endorsement within each cultural group.

Chapter 4 Summary

This chapter presented the qualitative findings from post-intervention interviews with Latino and Chinese participants regarding the perceived impact of the community-based learning intervention on cognition, functional independence, well-being, learning motivation, and learning self-efficacy. Using an inductive thematic analysis approach, themes were identified within and across cultural groups and integrated with quantitative findings through joint displays.

Across both groups, participants described perceived cognitive benefits, characterized as an awakening or stimulation of the mind through active engagement in learning. Participants also reported increased functional independence, particularly in the use of English and technology, which had practical value and contributed to greater autonomy in daily tasks. In relation to well-being, learning was described as fostering purpose, fulfillment, and positive emotion. Many participants additionally experienced the program as an escape from isolation and everyday struggles, although the framing of this experience differed across groups. A unique theme among Chinese participants highlighted feelings of youthfulness associated with intergenerational learning. For learning motivation, most participants reported an increase in their desire to continue learning, describing a shift from perceived motivation to a more embodied and future-oriented commitment to learning. Finally, learning self-efficacy emerged uniquely among Latino participants, who described strengthened confidence in their ability to learn and a shift in mindset as a result of successfully engaging in learning through the program.

Overall, the qualitative findings indicate that participants perceived changes across cognitive, functional, and psychosocial domains. The joint displays demonstrate areas of convergence and complementarity between qualitative themes and quantitative outcomes, providing a comprehensive representation of intervention-related experiences across both cultural groups.

CHAPTER 5

Learning Program Evaluation Results

Chapter 5 presents the quantitative ratings and qualitative themes related to participants' evaluation of the learning intervention (Research Question 3). Specifically, this chapter addresses the following questions: 1) What were participants' perceived barriers and facilitators/strengths to learning engagement during the intervention?; 2) How did participants perceive the overall value, benefit, and impact of the intervention?; and 3) What aspects of the intervention could be improved in future implementation? This chapter is organized in three sections. First, it presents the quantitative program evaluation findings based on participants' survey ratings. Second, it examines qualitative themes derived from interview data, alongside observational field notes and off-audio conversations, to provide a more in-depth understanding of participants' experiences. Finally, the chapter concludes with participant- and researcher-informed recommendations for future intervention work, highlighting areas for improvement. Evaluating the intervention through participants' perspectives provides critical insight into how community-based learning programs can be refined and strengthened. By examining perceived benefits and challenges, this chapter contributes to understanding not only whether the intervention was effective but how and why.

Quantitative Ratings on Program Evaluation

All 39 participants (10 Latino; 29 Chinese) completed a 6-item program evaluation survey assessing their experience in the learning intervention. The survey measured participants' perceptions of the instructors, class quality, overall experience,

and likelihood of participating again, using a 7-point scale ranging from 1 (“Terrible”) to 7 (“Excellent”). Total possible scores ranged from 6 to 42, with higher scores indicating more favorable evaluations. Overall, participants reported highly positive evaluations of the program, as the mean total evaluation score was 37.92 ($SD = 3.43$), with scores ranging from 29 to 42.

To examine potential differences in ratings by cultural group, an independent-samples t test was conducted. Results indicated that evaluation ratings did not significantly differ between Latino ($M = 39.40$, $SD = 2.11$) and Chinese participants ($M = 37.41$, $SD = 3.67$), $t(37) = 1.61$, $p = .115$. Although participants in the Latino group reported slightly higher evaluation scores on average, this difference was not statistically significant. The 95% confidence interval for the mean difference ranged from -0.51 to 4.48 . These findings indicate that participants across both cultural groups evaluated the intervention favorably.

Qualitative Findings on Program Evaluation

Following an inductive thematic analysis approach, themes were identified in the qualitative data corresponding to the evaluation questions addressed during participant interviews. Observational field notes taken by the lead researcher throughout the intervention, as well as relevant off-audio conversations, were incorporated to enrich and contextualize the findings where appropriate.

To respect potential cultural differences and preserve nuances, qualitative data from Latino ($n = 10$) and Chinese ($n = 20$) participants were first analyzed separately, using the same analytic procedures described in Chapter 4 with a sample size of 30

participants. Shared themes were merged, while group-specific themes were retained to highlight differences in experience. Themes are organized into three primary categories: 1) perceived barriers and challenges to learning engagement, 2) learning facilitators and strengths, and 3) overall perceived value and impact of the program. Themes within each category are presented in separate tables. Each table includes a description of the theme, the percentage of endorsement within each cultural group, and exemplary participant quotes. Interrater reliability analyses conducted for the themes specifically reported in this chapter indicated a high level of agreement among raters (average $k = 0.83$; Cohen, 1960).

Learning Barriers and Challenges

The interview protocol asked participants to reflect on the most challenging or difficult aspects of the intervention and to discuss any barriers or impediments they experienced in relation to their learning engagement. A total of four themes were extracted from participants' responses (shown in **Table 24**), including: 1) The challenge of navigating skill difficulty, course pace, and proficiency differences (53.3%; 16 out of 30), 2) Health and sensory problems as roadblocks to learning engagement (23.3%; 7 out of 30), 3) Forgetfulness as an obstacle to learning retention: The importance of learning how to learn in older adulthood (36.7%; 11 out of 30), and 4) Peer distractions disrupting learning focus (16.7%; 5 out of 30).

The challenge of navigating skill difficulty, course pace, and proficiency differences

Both Latino (60.0%; 6 out of 10) and Chinese (50.0%; 10 out of 20) participants described challenges navigating the learning process, including skill-related difficulties

and tensions surrounding course pace and alignment between instructional content and their existing proficiency levels. Some participants also described feelings of frustration while learning new skills, as well as shyness when seeking help and engaging in self-comparisons with peers who seemed to have been more advanced.

In regards to skill-related learning challenges, differences emerged in how difficulty was distributed across groups. Only participants who explicitly described skill difficulty as a barrier were coded under this theme and included in the endorsement percentage. However, the following results represent skill-specific perceived difficulty across all 30 participants. Among Latino participants, responses were evenly split, as 50.0% (5 out of 10) identified English as more difficult, while the remaining 50.0% (5 out of 10) reported that technology posed greater challenges. Among Chinese participants, a majority (60.0%; 12 out of 20) stated that English was more difficult, whereas 25.0% (5 out of 20) identified technology as more challenging. The remaining 15.0% (3 out of 20) were either unable to determine which skill was more difficult or did not explicitly indicate a preference.

For those that identified English as the harder skill, both groups mentioned the difficulties related to speaking and writing the language. A Latino participant said, “English was the hardest part, because it’s spoken one way and written another...that was the most challenging. With technology, you just tap something and it appears, but with English, if you get even one letter wrong, you end up saying something else.” Chinese participants, in particular, emphasized having a weak English foundation (e.g., being unfamiliar with the alphabet, vocabulary used, and structure of the language). A Chinese

participant mentioned, “My foundation was too weak.” Another one shared, “The hardest part, as I mentioned last time, is language organization. My English language organization skills seem pretty weak...I find speaking is still the hardest. Organizing thoughts in spoken English is really tough.”

For those that identified technology as more difficult, challenges were typically attributed to limited familiarity and lack of prior experience. Many described technology as the more novel skill, noting that, although English was difficult, it was something they had been previously exposed to over time compared to using a tablet device, which was more unfamiliar to them. Some described experiencing frustration with technology and, at times, feeling “stuck.” Nonetheless, technology was more frequently identified as the more enjoyable skill, regardless of perceived difficulty. For example, a Latino participant explained, “Oh, the difficult part was technology...since I had studied some English years ago, the English, reading and writing, that was very easy for me. And with technology, I still have many, many doubts and frustrations. Honestly, I enjoyed both, but even though technology has given me problems because I don’t fully understand everything yet, I liked technology more. I like challenging myself, the difficult things, not the easy ones.” Moreover, a Chinese participant explained that having received formal English education in China made English a more manageable skill in the program, whereas limited prior exposure to modern technology contributed to greater difficulty in learning the tablet: “For me personally, because I received higher education, I studied English from the age of 11 until I graduated from university. So, English seems easier for me. But relatively

speaking, I'm slower when it comes to computers. I didn't receive this kind of teaching method before, learning step by step over three months.”

In terms of proficiency level, some participants from both groups described a mismatch between instructional content and their background knowledge as a challenge. Several participants indicated that the English class, in particular, felt too advanced and would have benefited from being structured more at a beginner level. A Latino participant shared how the perceived advanced level of the English class contributed to feelings of inferiority when comparing herself to peers: “I think that if it had been at a lower level, I would have learned a bit more. Many of my classmates already have some knowledge of English and all of that, and that sometimes made me feel inferior because I didn’t understand it that well.” Similarly, a Chinese participant expressed a desire for the English instruction “to start from the basics, like vowel pronunciation”, explaining that doing so would have helped them follow the course more effectively. However, not all participants felt that the class was too advanced. One Chinese participant expressed the opposite concern, stating that both English and technology courses were not advanced enough given his higher proficiency level: “I already knew a lot...I didn't learn any new skills I wanted to learn...I hope you'll open an advanced version.”

Besides proficiency level, Chinese participants specifically emphasized the pace of the English class as a barrier. Some described the instruction as moving too quickly, limiting their ability to absorb and retain information. One participant explained, “I hoped it could be a little slower so I can learn better. If it's too fast and just glossed over, the learning is meaningless.” Another stated, “They cover too much in one day, it feels like

we can't keep up.” In the same vein, a participant said: “The English was too fast...the computer part is good, but the English part is too fast. We can't absorb so many new words. There are too many words, and we can't absorb them all.” While Latino participants did not explicitly discuss course pace during recorded interviews, observational data and off-audio conversations suggest that pacing concerns may have affected some Latino participants as well. Several participants across both groups also described the course as appropriately structured and well-paced for their needs. As one participant noted, “The English and computer courses were very good, truly step-by-step. It's like a beginner's class, guiding you through the process.” Another similarly shared, “The learning materials aren't too difficult; they're suitable for us elderly people.” Some participants also compared this program favorably to previous learning experiences that focused heavily on grammar rather than practical communication. As one participant discussed, “I think the knowledge taught in this program is very practical, focusing on conversation. When I studied elsewhere before, they taught too much grammar, which wasn't suitable for us seniors; the content wasn't as practical. So, I think this is great, and it would be wonderful if it could continue.” These differences in perspectives regarding course proficiency, pace, and content illustrate the variability that exists among participants and the challenge of designing a learning program that meets diverse needs within a single setting.

Shyness also emerged as a barrier to learning engagement across both groups. A couple of participants described feeling hesitant to ask questions due to having a timid personality, even when they needed clarification. A Chinese participant expressed,

“Maybe I was too embarrassed to bother people and ask questions.” Similarly, a Latino participant reflected, “I’m very shy, and I didn’t ask questions. I really did not want to, but the more you ask, the more you learn.” In these descriptions, shyness was a limiting factor that affected participants’ willingness to seek assistance, which potentially hindered their learning experience.

Overall, Latino and Chinese participants shared several similarities in how they described skill-related difficulties, proficiency level misalignments, and shyness as barriers to learning engagement. One notable difference was that Latino participants expressed engaging in peer comparison when learning, which generated feelings of inferiority, whereas Chinese participants focused more on describing structural aspects of the instruction, with an emphasis on course pace.

Health and sensory problems as roadblocks to learning engagement

This theme represents the impact that health-related challenges and age-related sensory declines had on some participants’ learning experiences. Latino (30.0%; 3 out of 10) and Chinese (20.0%; 4 out of 20) participants described physiological factors that at times limited their ability to fully engage in class activities. For some participants, health-related problems also interfered with their ability to complete study requirements and post-intervention procedures. However, these cases were not included in the endorsement percentages because those individuals were unable to provide post-intervention data.

Among Latino participants, health conditions involving physical discomfort, chronic pain, or caregiving responsibilities interfered with concentration, attendance, and

homework completion. One participant stated that the only barrier she faced during the program was her health, which sometimes limited the time and energy she could dedicate to learning. In another case, a participant described caregiving responsibilities for her husband, who was living with Parkinson's disease and was also enrolled in the program. These responsibilities occasionally prevented both of them from attending class or completing assignments. As mentioned, for some participants, health complications ultimately disrupted sustained engagement, including the ability to complete post-intervention procedures. These accounts illustrate how chronic health conditions and caregiving demands can constrain consistent participation in learning interventions. At the same time, several participants described the program as a positive outlet for coping with these ongoing health challenges (see Chapter 4).

In contrast, Chinese participants did not explicitly frame chronic health conditions as barriers in their interviews. Nonetheless, observational data and informal conversations suggested that temporary illnesses occasionally affected attendance. More prominently, Chinese participants discussed age-related sensory declines, particularly in eyesight and hearing, as obstacles to learning. One participant noted that impaired hearing and vision are detrimental to learning "because if you can't see or hear, it's very difficult to learn." Another described struggling to follow instruction due to difficulty hearing and seeing clearly, despite a strong desire to learn: "I can't hear or see well. My ears don't work, and my eyes don't work either, so I can't hear and I can't see clearly. I want to learn, but I'm unable to...because I can't hear what they're saying." A third participant highlighted having difficulty engaging with his English book due to small font size and visual strain:

“The font in the book was too small. My eyes felt uncomfortable looking at it, it was too small. I even used a magnifying glass. Next time, please give us a larger font.” These narratives suggest that sensory limitations, rather than chronic health conditions, were more salient barriers for Chinese participants in the intervention.

Forgetfulness as an obstacle to learning retention: The importance of learning how to learn in older adulthood

This theme captures Chinese participants’ discussions of age-related forgetfulness and memory decline as barriers to retaining newly learned information, which was uniquely raised by this cultural group (55.0%; 11 out of 20). Participants described memory problems, which they attributed to aging, as something that made learning more difficult and required greater effort to retain information over time.

Many participants explained that although they initially understood the material during class, they struggled to remember it afterward. One participant stated, “Some things are difficult to understand and remember in this short period. I remembered them well at first, but then I forgot them.” Another shared that reviewing material on the same day was essential to retention: “I could understand and apply the material during the classes. But I found that if I didn't review it the same day, I would forget it the next day, forget the steps. If I reviewed it two or three times that day, I would remember it completely. So, on the one hand, I need to practice more, and do it earlier, and take my own notes.” This experience suggests that repetition and immediate practice helped mitigate perceived memory limitations.

Participants frequently compared their current learning abilities to when they were younger, underscoring that retention now required more deliberate effort. As one participant explained, “I am still learning, it's just that my learning efficiency is not as good as when I was younger. Things I've learned, if I don't use them for two or three days, I forget them.” The importance of continued use and repetition was repeatedly emphasized. Several participants expressed concern that they would lose the skills acquired during the program once it ended: “Please come and teach us often. That way we won't forget. We forget things if we don't use them for a day...[learning] takes time. Older people have bad memories, so it takes time.” Across narratives, memory was framed as a cognitive limitation and a consequence of age-related changes. Some participants explicitly attributed their difficulty retaining information to aging, stating: “I've grasped it a little, but then I forget it quickly...I'm old now, and my brain doesn't work as well...I feel that I'm old, and my ability to learn isn't good.” These reflections show how perceptions of cognitive aging influenced participants' experiences of learning and their concerns about long-term retention.

Some participants felt un-equipped to independently manage these memory challenges throughout the learning process. They expressed a need for guidance on how to remember information effectively, highlighting a desire to learn strategies for learning itself: “Because I couldn't remember things. I needed to learn how to remember them.” Another participant made an important observation: “We used to have a saying, ‘You're never too old to learn.’ But how to learn? You need a method. That's important.” These

comments point to an essential need to tailor instructional guidance to teach older adults how to learn in older adulthood in the face of age-related cognitive changes.

Peer distractions disrupting learning focus

This theme represents participants' frustration regarding the side conversations, noise, and lack of attention from peers that occurred during the class sessions, which was uniquely discussed by Latino participants (50.0%; 5 out of 10) across interviews.

Participants described how peer conversations and lack of attentiveness occasionally interfered with their ability to concentrate and engage fully in the learning process.

Chatting and off-task behavior created distractions that disrupted their focus, making it difficult to follow instructions or remain engaged. As one participant shared: “The only inconvenience was all the talking...sometimes it didn’t let me focus. There’s no way to concentrate on what you’re doing when there are distractions.”

These disruptions most commonly occurred during translation periods, when instructions were delivered in one language and participants awaiting translation into their preferred language engaged in side conversations. As a result, overlapping speech created a noisier classroom environment. One participant explained, “There was a lot of chatter, that was really the only issue...when they were translating for everyone, people kept talking...so yes, it was a general problem.” These peer-related distractions were momentary barriers that affected participants’ concentration and the overall learning environment. Although Chinese participants did not explicitly report peer distraction as disruptive in their formal interviews, some raised concerns about classroom noise with

teaching assistants during the program, and a few even shushed peers during class in response to repeated interruptions.

Table 24.*Participants' Perceived Learning Barriers and Challenges Themes*

Theme	% of endorsement	Quotes
<i>The challenge of navigating skill difficulty, course pace, and proficiency differences</i> This theme reflects participants' experiences navigating skill difficulty, course pacing, and mismatches between instructional content and their existing proficiency levels.	Latinos: 60.0% (6/10) Chinese: 50.0% (10/20)	Latinos: "English was more difficult because I've never been able to write quickly, and writing in English is even harder for me." "Sometimes you get frustrated with certain little words or certain things, and you don't know how to continue, and you get stuck." Chinese: "I think it's very good, but I can't keep up with the pace." "For English, actually, my foundation is not good, so learning is a bit difficult."
<i>Health and sensory problems as roadblocks to learning engagement</i> This theme reflects how chronic health conditions, caregiving responsibilities, and age-related sensory declines limited some participants' ability to consistently engage in and complete learning activities during the intervention.	Latinos: 30.0% (3/10) Chinese: 20.0% (4/20)	Latinos: "Only my health [was a barrier] that I had working against time." Chinese: "I want to learn, but I can't hear. I have a hearing impairment, and my eyesight is also poor."
<i>Forgetfulness as an obstacle to learning retention: The</i>	Chinese: 55.0% (11/20)	Chinese: "Sometimes I couldn't remember things right away, due to my age."

<i>importance of learning how to learn in older adulthood*</i> This theme reflects Chinese participants' perceptions of age-related memory decline as a barrier to retaining newly learned information, often requiring repeated practice and continued use to prevent forgetting.		Sometimes I'd look something up, understand it, and then forget it again and have to look it up again." "I just have a terrible memory. I learned what the teacher taught, but I forgot it when I got home...My memory is too poor."
<i>Peer distractions disrupting learning focus*</i> This theme represents participants' perceptions of how side conversations, noise, and peer inattention during class sessions created distractions that interfered with their ability to concentrate and fully engage in the learning process.	Latinos: 50.0% (5/10)	Latinos: "They don't let you hear... they make it impossible to listen...they keep talking, they don't pay attention."

Note. Percentages represent endorsement within each cultural group; * = unique theme found only among one cultural group.

Learning Facilitators and Strengths

The interview protocol asked participants to discuss the factors that facilitated their engagement in learning, as well as any strengths or positive aspects within their community that made participation more feasible. Participants were also asked to reflect on whether they felt supported by others during the learning program, and if so, by whom and in what ways. Participants' responses to these questions yielded a total of six themes (see **Table 25**), which included: 1) The power of community-based research in supporting and facilitating learning engagement (66.7%; 20 out of 30), 2) Resource and environment accessibility as a facilitator of learning engagement (53.3%; 16 out of 30), 3) Safe learning atmosphere: Instructional guidance centered on clarity, kindness, and patience (86.7%; 26 out of 30), 4) Enhancing learning engagement through peer support and leadership (43.3%; 13 out of 30), 5) Intergenerational family support: Fostering pride and accountability through role reversal (40.0%; 12 out of 30), and 6) Resilient commitment to learning: The role of self-perseverance (20.0%; 6 out of 30).

The power of community-based research in supporting and facilitating learning engagement

This theme illustrates how collaborative efforts between community leaders, staff, caregivers, and the research team supported and motivated participants to engage in the learning intervention. Both Latino (100.0%; 10 out of 10) and Chinese (50.0%; 10 out of 20) participants emphasized that the partnership between their residential community and the research team made the program possible and accessible, highlighting the power of community-based research in action.

Many participants expressed appreciation for community leaders (e.g., residential coordinators and supervisors) and staff (e.g., residence managers and social workers) who helped secure and facilitate the opportunity. They described how these individuals provided space for the classes, promoted the program, and encouraged participation. One Chinese participant shared, “Our apartment manager and social workers helped us in various ways. For example, they gave us the opportunity to participate in learning this new knowledge, which made us very happy.” Another noted, “Our social workers helped us. They often find things for us... they also applied for these classes that you are teaching.” Participants valued that community leaders sought out opportunities on their behalf and advocated for programming that would benefit residents.

Community staff also played a practical and logistical role in sustaining engagement. The residential manager and social worker coordinated weekly use of the community room, ensured that the space was set up appropriately, and helped remind participants about upcoming classes. Some caregivers further supported engagement by encouraging attendance and assisting with homework completion. A Latino participant reflected on the importance of this encouragement: “I have my caregiver and she knows a lot and she teaches me and helps me a lot... she really encouraged me too. I asked her, ‘At my age, do you think I can learn?’ and she said, ‘Yes, you can learn.’ And so I came, and I learned, and I felt very comfortable and very happy.” These layered forms of support in the community helped reduce barriers and promote consistent participation. Overall, they viewed their community as supportive of their engagement: “The community is supportive. The community is great!”

Participants also spoke highly of the research team's role in fostering engagement. They described feeling motivated by the attentiveness, encouragement, and respect they received. A Latino participant stated, "First of all, you were motivating us, looking out for us, and supporting us in every way. Honestly, I've never experienced a group of people like you before. It meant so much to me." Such comments suggest that the partnership between community stakeholders and researchers created a learning environment that not only granted access but also provided interpersonal care.

Across interviews, participants noted that feeling valued, heard, and cared for was emotionally uplifting and served as a powerful motivator to attend and remain engaged despite challenges related to age or skill difficulty. A Chinese participant shared, "At this age, I'm very happy and touched by the care and attention everyone gave to us elderly people." Similarly, a Latino participant expressed, "You were all very kind. You made us feel good, you made us feel cared for, like we were important." These descriptions illustrate how warmth and collaborative support were facilitators of learning engagement.

While both Latino and Chinese participants stressed the importance of collaborative support, subtle differences emerged in how this support was framed. Chinese participants more frequently highlighted the role of community leaders and social workers in securing and organizing opportunities, showing appreciation for community advocacy. In contrast, Latino participants more frequently emphasized interpersonal encouragement and emotional affirmation as key to their engagement.

Resource and environment accessibility as a facilitator of learning engagement

Both Latino (100.0%; 10 out of 10) and Chinese (30.0%; 6 out of 20) participants described how the structural design of the intervention reduced engagement barriers and made participation feasible through easy accessibility. The program's location within participants' residential community emerged as a main facilitator, given that it eliminated transportation challenges and reduced dependence on others for mobility. Participants also discussed the convenience of having all necessary learning materials provided at no personal cost.

Participants emphasized that not having to travel outside their building increased their ability and willingness to engage. A Latino participant described the location as "such a great advantage because one does not have to travel somewhere else," noting that she no longer drives and previously relied on her husband, who had recently lost his ability to drive due to a medical condition. Others echoed this sentiment: "Some of us don't drive, so for us it is much easier that [the program] was here...it really helped us that we did not have to go elsewhere." Another participant highlighted how transportation limitations had prevented prior engagement opportunities: "Many times what we say is, 'Oh, I don't have a way of getting there'...I don't drive, I have to ask people for help. So, you coming here to my own home address, for me that meant just having to come downstairs and I would already arrive at school."

Chinese participants similarly talked about the value of on-site instruction. One participant stated, "Because you come to our place to guide us and teach us. This opportunity is rare. Because we don't go out much, we don't know the way, and there's no one to accompany us. We don't know where to go. Now, you come to our home to give us

classes and help us learn. What a great opportunity!” Another explained, “Going outside is more troublesome, but it's easier here...we don't have a car to go outside.” These expressions illustrate how easy proximity to the learning program reduced transportation burdens and made participation feel realistically attainable.

Beyond transportation, participants also highlighted the provision of materials at no cost as a significant facilitator and motivator to engage (e.g., “Everything was handed to me...that’s what motivated me more to participate.”). Participants talked about how the program “facilitated all of the learning tools, making it easy [for them] to engage in learning.” Supplies, notebooks, tablets, and other resources were provided free of charge, eliminating potential financial barriers. A Latino participant explained, “They made everything easy for us. They gave us the computer [tablet], a backpack with everything we needed, that was the main motivation. You didn’t have to worry about, ‘What am I going to bring?’ or ‘How am I going to do this?’ That was very motivating.”. This description shows how providing learning resources for participants not only increased convenience but also alleviated potential financial stressors associated with learning new skills. A Chinese participant similarly reflected on the accessibility of the program: “It feels great...they let us learn for free, we have food, and we even get money.” In addition to providing free learning materials, participants were offered lunch during the final hour of classes, which also encouraged attendance and engagement.

Resource and location accessibility were consistently mentioned as key facilitators of engagement across Latino and Chinese participants. Subtle differences in emphasis emerged in that Chinese participants more frequently underscored the

convenience of not having to travel, whereas Latino participants more prominently noted the financial accessibility of materials and supplies. Nonetheless, for both groups, reducing these structural barriers was fundamental to enable their participation. It is important to also note that although structural accessibility was overwhelmingly described as a strength, observational data indicated occasional technological limitations, particularly intermittent Wi-Fi disruptions when multiple tablets were used simultaneously during the technology class.

Safe learning atmosphere: Instructional guidance centered on clarity, kindness, and patience

This theme captures participants' perceptions of the instructional environment as safe, welcoming, and comfortable. Both Latino (100.0%; 10 out of 10) and Chinese (80.0%; 16 out of 20) participants described the teaching team, including instructors and research assistants serving as teaching assistants, as essential in creating a learning atmosphere that encouraged engagement. Instruction was viewed as clear, responsive, and tailored to participants' needs, allowing them to feel comfortable asking questions and making mistakes.

Participants across groups emphasized the patience and kindness of instructors. When they felt confused or uncertain, instructors repeated explanations, clarified steps, and ensured understanding without judgment. A Latino participant shared, "[There was] a lot of support, especially from your whole teaching team, you were there for us with any question we had," while another one stated, "[The instructional team] supported us because when we asked something, they were very kind in teaching us." Another

described, “The way they explained everything to us... if we didn’t understand, they would say it again. In that sense, they were very open and explained things clearly.” Importantly, this participant contrasted this experience with a previous learning environment in which she had been mocked for speaking English when she was younger, noting that this program felt like a safe space for making mistakes.

Chinese participants similarly mentioned the instructors’ patience, enthusiasm, and responsiveness. One participant stated, “If there were any difficulties, I could always ask questions anytime, anywhere. The teachers and assistant teachers are all so enthusiastic in helping us.” Another remarked, “You’re all so nice and patient. Whether you’re the teachers or the assistants, everyone is so friendly and patient, teaching us one by one.” These reflections highlight how individualized attention and supportive teaching practices fostered comfort and trust.

In addition to emotional safety, participants stressed that instructional guidance itself was essential for learning. Several expressed that having access to materials alone would not have been sufficient without supportive teaching. As one Latino participant explained, “If we had the [learning] equipment without guidance, we would not have opened our minds as much.” Another shared, “There is no use in having the tools to learn if there isn’t someone that is teaching us.” For some, knowing that dedicated instructors would guide them through the learning process was a motivating factor in choosing to participate. A Latino participant shared, “What I liked was that we were going to have your team to guide us in everything, and that encouraged me to accept joining [the

program],” while a Chinese participant similarly noted, “There are professors and students who help us, so I participated in this program.”

Instructors were described as approachable, attentive, and affirming. Participants valued that teachers paid attention to their individual progress and celebrated their efforts. One Chinese participant observed, “Everyone was supportive, and the teachers too. They would applaud us even for a simple answer.” Another reflected on the positive classroom atmosphere created by instructor enthusiasm: “I think the teachers’ enthusiasm in class has a positive influence. Creating this lively atmosphere makes learning very enjoyable, and everyone is willing to learn, unlike a dull and boring environment.” A Latino participant captured the motivational impact of this teaching style: “It was the attitude you all had, it really encouraged me, that was key for me. Because if there hadn’t been so much joy and connection from you, we wouldn’t have felt motivated and that helped us so much...I felt comfortable.”

Perceptions of instructional safety and guidance were largely consistent across cultural groups. Both Latino and Chinese participants described the instructional team as creating a positive and psychologically safe learning environment. Patience, clarity, individualized attention, and encouragement were identified as key mechanisms that enabled sustained engagement. Participants felt comfortable asking questions, making mistakes, and trusting those guiding their learning, conditions they viewed as essential for their participation and continued involvement.

Enhancing learning engagement through peer support and leadership

This theme highlights the role of peer relationships in supporting and enhancing the learning engagement of participants through encouragement and collaboration. Latinos (60.0%; 6 out of 10) and Chinese (35.0%; 7 out of 20) participants described supporting one another by working on homework assignments, collaborating on in-class activities, and hosting informal study sessions outside of class. These peer interactions fostered accountability and reinforced commitment to learning.

Some participants described a shift from being just learners to assuming informal teaching or leadership roles among their peers. Classmates sought them out for help with assignments, and several participants reported visiting one another's homes to review material and practice new skills together. One Latino participant shared, "I learned a lot, [name] and [name] would go to my house for me to teach them...I liked that they would come to my house and we would sit and I would serve them coffee or water...I felt very comfortable...they call me 'the teacher' (laughs)." Chinese participants described similar reciprocal support. One noted, "Yes, my friends, including my husband, are also learning...we study together, learning from each other." Another stated, "Those who are learning together, we support each other. For example, asking if they're going today, or finding a seat for them. Or just talking about what we've learned together and discussing the topics. That's all helpful." These examples highlight how peer relationships created informal systems of learning accountability and encouragement.

For some participants, peer influence played a direct role in program enrollment. As one participant explained, "My friends were all participating, so I joined too." In this way, peer relationships not only led to sustained engagement but also were an entry point

into the intervention itself. Observational field notes further corroborated this pattern, indicating that several participants across both cultural groups enrolled after being invited by neighbors or friends. These results indicate that peer relationships served as a recruitment tool and motivation for sustained engagement in the learning program. Some participants also noted that the opportunity to learn alongside peers in a group setting was itself a reason for participating: “I attend classes because I feel it's a group setting. So it's also very enjoyable...There's a social atmosphere; everyone is in class together.”

Despite differences in endorsement rates, no substantial cultural differences emerged in the peer support described by participants. In both groups, peers studied together, supported homework completion, reminded one another about class attendance, and, in some cases, assumed informal leadership roles. Peer support was a motivational facilitator of learning engagement across both groups.

Intergenerational family support: Fostering pride and accountability through role reversal

This theme captures the role that children and grandchildren played in supporting participants' learning engagement. Latino (50.0%; 5 out of 10) and Chinese (35.0%; 7 out of 20) participants described receiving encouragement, assistance, and emotional support from family members, who expressed pride in their accomplishments and celebrated their participation in the program. This intergenerational dynamic served as motivation and accountability, reinforcing participants' commitment to learning. Importantly, participants' narratives demonstrated a reversal of traditional generational roles. Rather than younger generations striving to make their parents or grandparents proud, many

older adult participants described wanting to earn the approval and pride of their children and grandchildren. Their desire to demonstrate capability, growth, and perseverance to younger family members emerged as a motivator for continued participation. This role reversal strengthened participants' learning habits and feelings of pride and accomplishment. As such, learning became not only an individual pursuit but also an intergenerational experience for some participants.

Latino participants frequently described how their children or grandchildren helped keep them accountable and encouraged them to complete assignments and practice their skills. One Latino participant shared how her grandchildren motivated her to complete her homework through playful persuasive strategies: "My grandkids tell me, 'Grandma...where's your homework? Did you do it already?' They pushed me a lot (laughs), saying, 'How are you going to go on a trip if you haven't done your homework?' I really love fragrances, and one day my daughter came with her husband and [my grandkids] said, 'Grandma, if you don't finish your homework, we are not taking you to the mall' (laughs). So, they were there helping me, saying, 'Because if you don't, your wish won't come true.' I thought they were just joking, but believe it or not, they actually took me and bought me a perfume." Another Latino participant stated how her son supported her learning: "My son would motivate me a lot to do my homework and he would help me correct my English." Some participants also intentionally used interactions with younger family members as opportunities to practice new skills: "I told my grandkids 'don't speak anymore Spanish to me, speak to me in English' (laughs)." Latino participants also spoke about the pride they felt when sharing their achievements

with family members. One participant reflected, “After the course, the graduation, and receiving this diploma, I sent it to my grandchildren and my children. I could feel how proud they were of their grandma. And I feel like they’ll be able to say, ‘If my grandma can do it, why can’t I?’”

Chinese participants had similar experiences of receiving encouragement and support from family members. One Chinese participant explained, “My family is very supportive...my son, when I would ask him, he would tell me properly. He still explained things to me very well. He knew that no matter how difficult or easy it was, he would explain it to me properly, every time.” Another one said, “My son and daughter both support my learning. They said, ‘Mom, you’ve made great progress.’” A third participant described how learning created opportunities for connection with family members: “Yes, my daughter and grandchildren, they all like that I’m learning...[it has] a positive impact because I can tell my daughter what I learned when I get home.” Observational data further supported these accounts. Participants frequently asked the research team to take photos of them during class activities or at the graduation ceremony while wearing their caps and gowns so they could share these moments with their children and grandchildren, highlighting their pride in participating in the learning program.

Across interviews, intergenerational family support was a facilitator of engagement for both cultural groups. Participants from both Latino and Chinese backgrounds described encouragement, practical assistance, and emotional affirmation from family members as motivating factors in their learning journeys. Latino participants, however, more frequently shared detailed stories highlighting feelings of pride expressed

by younger family members. Nonetheless, across both groups, there was a shared desire among participants to make their children and grandchildren proud, showcasing the significance of learning within family systems and the importance of receiving family support.

Resilient commitment to learning: The role of self-perseverance

This theme reflects Chinese participants' (30.0%; 6 out of 20) descriptions of their own perseverance and personal commitment as important strengths that supported their engagement in the learning program. Participants emphasized the role of resilience, determination, and sustained effort in helping them continue learning, even when they initially doubted their ability to stay in the program or encountered challenges. Their experiences highlight how internal motivation and persistence served as key drivers of their continued participation.

Several participants described intentionally prioritizing the program and adjusting their schedules in order to remain engaged. One participant explained, "When I had something to do, I quickly rearranged my schedule. For example, if I missed Monday's class, I would catch up the next day. I think this perseverance is quite good because I'm very interested in this learning." Another participant reflected on the personal effort required to remain committed, stating, "I really wanted to learn and I applied myself." Similarly, another participant described overcoming doubts about whether they would continue in the program: "I thought I would give up halfway, but I didn't, I still came to class every week."

Although only a small number of Chinese participants explicitly articulated perseverance as a facilitator of engagement during interviews, observational field notes suggested that this form of resilience was present among many participants' learning experiences, including Latinos. Throughout the program, participants frequently persisted through moments of frustration, technological difficulty, and initial uncertainty about their ability to learn new skills. They consistently and punctually attended classes, practiced the learned skills, and completed activities despite these challenges. These observations suggest that self-perseverance may have been an underlying strength among participants, even when it was not explicitly verbalized during interviews.

Table 25.*Participants' Perceived Learning Facilitators and Strengths Themes*

Theme	% of endorsement	Quotes
<i>The power of community-based research in supporting and facilitating learning engagement</i> This theme reflects how collaborative support from community leaders, staff, caregivers, and the research team facilitated participants' sustained learning engagement.	Latinos: 100.0% (10/10) Chinese: 50.0% (10/20)	Latinos: "Every time I asked something to my caregiver, she helped me and she really helped me a lot." "I think that in a way, yes, it was thanks to the support [of the community leaders], because you see, if they hadn't supported it, it wouldn't have happened." Chinese: "Yes, our community strongly supports us." "Our community itself...they provided such a good venue, such a good space. And the social workers were also very proactive."
<i>Resource and environment accessibility as a facilitator of learning engagement</i> This theme highlights how the intervention's structural design, particularly its on-site location and free learning materials, reduced transportation and financial barriers, facilitating participation and engagement in learning.	Latinos: 100.0% (10/10) Chinese: 30.0% (6/20)	Latinos: "I didn't have to spend money on anything...everything was given to us right on our table, how could we not enjoy this!" "It was right here, where we did not have to go out. So, it was such an excellent thing, truly!" Chinese: "Hey, we don't have to drive to school. What a great opportunity." "Because we live here, we have

		access to this information...we're able to get this opportunity and have such great conditions for us seniors. We are fortunate people. So, when I saw that it was a regular university running this learning program, and we live here, it's safe and convenient, right in our own home. So, everything is perfect – the timing, the location, and the people.”
<i>Safe learning atmosphere: Instructional guidance centered on clarity, kindness, and patience</i> This theme captures how responsive instructional guidance centered on clarity, kindness, and patience created a safe and positive learning environment that facilitated engagement.	Latinos: 100.0% (10/10) Chinese: 80.0% (16/20)	Latinos: “What did I like the most? The teachers were very attentive when teaching us. That’s what I really liked. I liked the attention they gave us.” “The learning process was excellent as well as the instructors who gave us the lessons.” Chinese: “Every one of them is so patient, every one of them, whether they're teachers or the tutors. How do I put it? They're so nice. If you don't understand something, they'll slowly teach you.” “The teachers, both the main teachers and the assistant teachers, helped us a lot, which was great.”
<i>Enhancing learning engagement through peer support and leadership</i> This theme reflects how peer relationships enhanced learning engagement through collaboration, mutual	Latinos: 60.0% (6/10) Chinese: 35.0% (7/20)	Latinos: “I would ask one or two peers that I had in the program if I had any doubts or questions.” Chinese: “Yes, everyone helps each other. If we needed to send an email in

encouragement, shared accountability, and informal leadership among participants.		computer class, the [peer] next to me would write down their email address.”
<i>Intergenerational family support: Fostering pride and accountability through role reversal</i> This theme shows how encouragement, assistance, and pride expressed by children and grandchildren motivated participants’ engagement in learning, while creating a sense of accountability and reversing traditional generational roles.	Latinos: 50.0% (5/10) Chinese: 35.0% (7/20)	Latinos: “My daughter tells me, ‘Mom, you have to go to school.’...she feels proud of me.” “My daughter tells me, ‘Mom, you can do it’ and ‘give it your best.’ She tells me to put the pain aside and keep going. And yes, it really has helped me—it has helped a lot.” Chinese: “But next time I don't understand something, I can ask my grandson...My grandson and his family come over often. Sometimes they ask him to help and teach me.” “My children are very supportive...My daughter and son-in-law are very supportive.”
<i>Resilient commitment to learning: The role of self-perseverance*</i> This theme represents how participants’ personal perseverance, determination, and commitment to learning supported their continued engagement in the program despite initial doubts or challenges.	Chinese: 30.0% (6/20)	Chinese: “Every time I come to class, I never take a day off.” “I was able to persevere. I didn't give up at all.”

Note. Percentages represent endorsement within each cultural group; * = unique theme found only among one cultural group.

Perceived Value and Impact of the Intervention

Participants were asked to think about the value and impact they experienced from participating in the program, including which components they found most enjoyable and what they derived from their overall learning experience. Analysis of participants' responses revealed four themes highlighting the value of the program (see **Table 26**). Themes were: 1) From skeptic to believer: Exceeding expectations through trust and care (23.3%; 7 out of 30), 2) From neighbors to friends: Strengthening social connection, bonding, and belonging (73.3.0%; 22 out of 30), 3) A rewarding and empowering learning opportunity: Gratitude and eagerness to participate again (96.7%; 29 out of 30), and 4) Reflections on sustained engagement: Benefits and barriers beyond program completion (93.3%; 28 out of 30).

From skeptic to believer: Exceeding expectations through trust and care

This theme uniquely reflects Chinese participants' (35.0%; 7 out of 20) descriptions of the program as exceeding their initial expectations. Several participants entered the program with uncertainty or skepticism about what the learning experience would entail. However, after participating, their perspectives shifted as they experienced the quality, care, and practical value embedded in the program. This theme captures instances in which participants described the program as unexpectedly better than they initially anticipated or more worthwhile and impactful than they had originally assumed.

For some participants, this shift in perspective was represented by an initial misunderstanding of the program's purpose. One participant explained that at the beginning she was unsure of the program's intentions but later came to view it very

positively: “I didn't expect it to be this good at first, but now I see it's truly excellent. Really!” Another participant described how her initial curiosity was accompanied by some skepticism about the program’s research intentions. Prior to participating, she believed that the program might simply be using older adults as subjects for experimentation. However, after experiencing the program firsthand, her perspective changed as she observed the effort invested in designing learning experiences that were responsive to participants’ needs: “This learning program is much better than I imagined. Before, I thought it was a laboratory, and that they were using us elderly people as guinea pigs for experiments, but I participated with great curiosity. But since participating, the content of each class, including the teaching materials prepared by the teachers, the teaching quality, and the translations by the university students, have been excellent...The whole process was great and very practical. It's truly a learning program tailored for us elderly people, and we have benefited greatly from it.”

Chinese participants’ initial uncertainty about the program’s intentions changed upon engaging with the program. It became evident that the learning experience was designed with the intention of prioritizing their needs and providing practical benefits, helping build trust and restoring a better view of research intentionality.

From neighbors to friends: Strengthening social connection, bonding, and belonging

This theme captures participants’ perceptions of social connection as one of the most enjoyable and meaningful aspects of the program. Latino (100.0%; 10 out of 10) and Chinese (60.0%; 12 out of 20) participants described how strengthening existing relationships, forming new friendships, and engaging in shared social experiences

contributed significantly to their positive experiences in the learning intervention. Many participants emphasized that the opportunity to gather, interact, and build relationships was what they most looked forward to each week.

Among Latino participants, the program created a space for *convivencia*, a shared social experience composed of warmth, interaction, and presence that fostered positive emotions and enhanced participants' overall enjoyment (as discussed in Chapter 4). Several Latino participants described how the program transformed the residential building from a place of simple cohabitation into a more connected community. Individuals who had previously known each other only as neighbors began forming friendships. As one participant explained: "Now we've all come together. Before, we were all in this building, but we didn't really know each other, but now we do...Thanks to the program, we became better friends." Chinese participants shared similar observations regarding the stronger sense of connection that developed within their community through the program. One participant remarked: "At least downstairs, in our building, there are so many people we can't get to know. But after coming here, everyone got to know each other."

For some participants, the sense of connection extended beyond relationships with fellow participants, including the research team and instructors. One Latino participant shared how she felt that she had also developed friendships with those facilitating the program: "I had the opportunity to make more friends. Here, I met the people who came to help us. I met them here, and they are very good people, and now they are my friends." Participants frequently identified companionship and shared time with others as the most

enjoyable aspect of the program. As one participant expressed: “What did I enjoy the most about the program? The company we had...being together and spending time with other people.” Echoing these sentiments, a Chinese participant highlighted how being surrounded by others created feelings of joy and reduced loneliness: “Being among people is a joyful thing, not lonely, not being without anyone to talk to. Even if we can't talk during the class, at least we have you young teachers. When I ask a question, you teach me, which is a form of interaction...which is much better than sitting at home all day with no one to talk to. So, participating in group activities is beneficial.”

Both Latino and Chinese participants emphasized that the program provided opportunities for social interaction, friendship, and shared experiences. There were no notable differences between cultural groups for this theme. Through regular gatherings and collaborative learning, the program helped transform previously distant neighbor relationships into friendships, strengthening participants' sense of community connection and belonging.

A rewarding and empowering learning opportunity: Gratitude and eagerness to participate again

This theme encompasses participants' descriptions of the program as a rewarding and empowering experience. Latino (100.0%; 10 out of 10) and Chinese (95.0%; 19 out of 20) participants viewed the intervention as an opportunity that opened new doors for them, restored their confidence, and challenged internalized beliefs about aging. Many participants described the experience as something that transformed their thinking, emphasizing that growing older did not mean that learning, growth, or activity

engagement had to come to a stop. Instead, participation in the program helped them recognize that they still had the capacity to learn and improve themselves. As such, this theme represents the broader impact of the intervention and synthesizes participants' experiences reflected across other themes.

Participants described the program as empowering because it reshaped how they viewed their own potential in later life. For some Latino participants, the experience challenged the notion that aging meant slowing down or withdrawing from new opportunities. As one participant shared: "With this program we came to realize that the world hasn't stopped for us older adults; rather, we are the ones who tend to stop. But the world hasn't stopped, even though we are older...I no longer think that because we are older that we cannot do something anymore, I feel that there is always something more to learn." Others expressed that participating in the program reinforced their sense of personal value: "It made me feel happy and like older adults are still very valuable, that we still have a lot to give and a lot to learn."

Chinese participants shared similar experiences, describing the program as a rewarding opportunity for personal improvement, growth, and expanded perspectives. The learning experience was discussed as helpful in developing new knowledge and broadening their outlook on life. One participant summarized this experience by stating: "Having this opportunity to learn is a great thing; it allows me to improve myself." Others described how the program exposed them to new ideas and encouraged them to think differently about their daily lives: "I've been exposed to many things I hadn't encountered before, and my horizons have broadened." Another participant shared how

the program motivated them to think more intentionally about their health and lifestyle habits, referencing what they learned in the motivational discussions: “I've seen hope. Because learning has improved me, and there are so many methods that I should use in my life. To enrich my life and improve my health. My brain has been stimulated; I didn't think about these things before, but now I do, especially about eating...there's even an order to eating that's good for the body, which I learned for the first time.”

Expressions of gratitude were consistently present throughout participants' responses. Many participants described the program as a valuable opportunity and expressed deep appreciation for the instructors, students, and research team who made the experience possible. Latino participants frequently described the program as a blessing and an important turning point in their lives. One participant reflected: “These courses were definitely the door that opened things up for me, the door to doing something and moving forward. It was a very important turning point for me, so thank you to everyone who made all of this possible.” Others further expressed appreciation for the collective effort that contributed to the program: “I'm very grateful to everyone, to all the people who contributed to motivating us. I'm very thankful to every person who added their little grain of sand to make this program possible.” Chinese participants also expressed strong appreciation for the opportunity to participate. For some, this was the first formal educational opportunity they had experienced in many years: “This was the first time we've had this kind of opportunity after the age of 65. It's the first time I've had this opportunity in over ten years...Thank you very much.” Another participant simply stated: “Overall, it's been excellent. I'm very grateful to the entire project team.”

Participants from both groups also emphasized their strong desire to continue participating in similar programs if given the opportunity. Many expressed hope that the program would return to their community so they could keep learning. Latino participants described their enthusiasm for future opportunities: “We hope you will come again if there is another opportunity for us to learn something new.” Another Latino participant shared, “I hope these kinds of great opportunities continue, like the one you gave us, to come into our lives and help us realize that we are still important to someone.” Chinese participants echoed these sentiments, expressing similar hopes for continued learning opportunities: “I’m so grateful and deeply in need of this. We hope to have this opportunity again, in our lifetimes,” and “I’m planning to wait for you guys to come again. If you have another learning opportunity like this.”

For many participants, the opportunity to engage in formal learning also carried personal significance due to limited educational opportunities earlier in life. Several participants said that they had not been able to pursue education when they were younger because of financial, linguistic, or structural barriers. As a result, participating in the program represented an opportunity to fulfill aspirations that had been previously unattainable. One Chinese participant explained: “I didn’t go to school much before, I didn’t have much education.” Another participant shared how they had “a level of education that did not even reach learning how to calculate division”, and so, this learning opportunity was of high value to them. In the same vein, some participants described the celebration at the end of the program as especially impactful. For several individuals, wearing a cap and gown during the graduation ceremony and receiving a

diploma marked the first time in their lives that they had participated in such a milestone, symbolizing a moment of recognition for their learning achievements. A Chinese participant shared with her daughter: “I got my diploma today! It’s the highest level of education I’ve ever received! I was fortunate to participate in a 3-month course tailored for seniors...It was truly a beneficial experience for all of us!...The classes were excellent!...The benefits were even better, and I’m so grateful!...Most importantly, it gave me a direction to strive for and encouraged me to pursue lifelong learning! Today’s graduation ceremony was fantastic! It left me with wonderful memories!” Observational field notes from the day of the graduation ceremony further supported these descriptions, as several participants made similar remarks.

Participants’ narratives highlight the personal impact and significance of the program. Beyond skill development, the intervention was experienced as an empowering opportunity. Participants widely expressed gratitude and demonstrated strong enthusiasm for future programs that would allow them to continue engaging in educational experiences. No major differences emerged between Latino and Chinese participants for this theme. Participants across both groups consistently viewed the program as a highly rewarding experience and expressed a strong desire for similar learning opportunities to be offered again in the future.

Reflections on sustained engagement: Benefits and barriers beyond program completion

This theme represents participants’ reflections on continuing learning beyond the conclusion of the program. Both Latino (90.0%; 9 out of 10) and Chinese (95.0%; 19 out

of 20) participants discussed the value of sustained learning engagement while also identifying potential barriers that could limit their ability to continue learning independently. Participants frequently described lifelong learning as beneficial for maintaining mental stimulation, supporting brain health, and preventing cognitive decline in older age. Participants also recognized that maintaining this engagement after the structured support of the program ended could be challenging, as the barriers to learning addressed by the learning intervention would disappear.

Several participants emphasized the importance of continued learning for maintaining cognitive health and staying mentally active in later life. Learning was frequently described as a way to stimulate the mind and support overall cognitive functioning. Latino participants stated that lifelong learning was “important to maintain an agile mind.” One Latino participant explained: “[Learning] really helps with memory and good health because it exercises the brain, and that’s very good. It helps a lot. The brain is the motor of the body, studying provides mental computation and a lot of exercise to the mind.” Chinese participants more often framed ongoing learning as a way to prevent memory loss or dementia. As one participant stated, “It will prevent dementia...so we won't get dementia, and we can make progress.” Another Chinese participant reflected on the relationship between learning opportunities and cognitive health in later life, comparing the experiences of younger and older individuals: “Because if elderly people don't learn new things, their brains will deteriorate quickly. If there's nothing new to stimulate the brain to think and function, they will quickly develop dementia. So learning is very important, especially for the elderly. Young people have many learning

opportunities, but for the elderly, the opportunities become fewer. So seizing learning opportunities can help the elderly avoid dementia.”

Despite acknowledging the importance of lifelong learning for brain health, participants also thought about the barriers that could make sustained learning difficult without the support provided by the program. Latino participants primarily identified language and financial barriers. Some explained that courses offered at nearby community centers were typically conducted in English, creating access challenges for individuals with limited English proficiency. One participant described this barrier by stating: “I want to take a course...but for that...you need to be fluent in English...for that I would need to write and speak English perfectly.” Financial barriers were also mentioned as limiting access to continued learning opportunities. For example, one participant shared that she became inspired to continue learning and considered enrolling in a sewing course, but when she contacted local programs to ask about enrollment costs, the classes were too expensive for her to attend.

Participants from both groups also described the absence of ongoing instructional guidance and structured learning environments as a significant challenge. Many felt that the support, encouragement, and accountability provided by instructors and peers played an important role in maintaining their motivation to learn. Without this structure, some participants expressed uncertainty about their ability to continue learning independently. One Chinese participant stated: “I don't have the motivation to learn by myself.” Similarly, another participant emphasized the importance of having guidance during the

learning process: “It would be good if someone helped me [learn], but I can't do it alone. I'm happy if someone helps me, but I can't do it without help.”

Some participants demonstrated a willingness to seek alternative ways to remain engaged in learning if similar opportunities became available. For example, one Chinese participant explained that although she did not drive, she would still be willing to attend future classes if they were accessible through public transportation: “As long as there are similar classes, I will participate. I just need one that suits me. Like this program being held in our apartment building. It's very convenient for people. For example, if it were held in another location, as long as there's a bus that goes there, I can go, because I don't drive.”

Noteworthy, while participants discussed plans to remain engaged in learning, many clarified that their motivation was primarily focused on further developing the specific skills introduced in the program. The majority of participants indicated that they would be most interested in continuing to learn English and technology in order to further master them. Participants from both groups emphasized that acquiring these two skills alone already represented a significant challenge and learning goal: “These two alone are already overwhelming...these two are enough. Once I master these two, I might expand.” A participant shared, “Besides English and electronic products, we don't really need anything else. We don't need to make a living or start a business, so there's no need for specific skills. It's not like we need to work or start a business and learn new skills right now. For us right now, the best thing is to just learn what we have at hand.” As such, rather than expressing interest in exploring a wide range of new skills, many described

their motivation as centered on deepening their knowledge in these areas, which they viewed as the most practical and essential skills for their daily lives.

This theme highlights participants' recognition of the importance of lifelong learning for maintaining cognitive health while also acknowledging the structural, linguistic, financial, and motivational barriers that may affect their ability to sustain learning engagement beyond the completion of the program. Some differences in emphasis emerged between Latino and Chinese participants. Chinese participants more frequently discussed lifelong learning in relation to cognitive health and dementia prevention. In contrast, Latino participants more frequently emphasized financial and transportation barriers when thinking about future learning engagement, whereas Chinese participants placed greater emphasis on the lack of instructional guidance and support.

Table 26.

Participants' Perceived Value and Impact of the Learning Intervention Themes

Theme	% of endorsement	Quotes
<i>From skeptic to believer: Exceeding expectations through trust and care*</i> This theme highlights participants' experiences of the program exceeding their initial expectations, as early skepticism shifted toward trust and appreciation after observing the care, quality, and practical value of the learning experience.	Chinese: 35.0% (7/20)	Chinese: "I think it exceeded my expectations; I gained a lot." "I had no idea what the program was about. I didn't know, so I signed up anyway. I really hit the jackpot. It was a lucky break."
<i>From neighbors to friends: Strengthening social connection, bonding, and belonging</i> This theme reflects participants' perceptions that the program fostered meaningful social interaction, transforming neighbors into friends and strengthening social connection, bonding, and belonging within the community.	Latinos: 100.0% (10/10) Chinese: 60.0% (12/20)	Latinos: "It benefited me because...I spent time with the teachers and with my neighbors, the other older adults. That companionship helped me a lot, being together." "It's the best thing one could wish for here where we live, to spend time together...talk with each other, greet one another, and know how everyone is doing. It's nice." Chinese: "Because of this program, I've made friends with people who live in the same building, and I'm very happy about that." "It was like everyone got to know each other. And then, after getting

		to know each other, we can see that there's a lot we can learn from these people.”
<i>A rewarding and empowering learning opportunity: Gratitude and eagerness to participate again</i> This theme captures participants’ experiences of the program as a rewarding and empowering learning opportunity that generated deep gratitude and enthusiasm for repeated participation.	Latinos: 100.0% (10/10) Chinese: 95.0% (19/20)	Latinos: “I’m grateful for you doing this for older adults, for us. It’s a blessing, you know, it’s truly a blessing.” “I never expected to receive this benefit of learning English and using the computer. I never expected it, and it was a great help for all of us and a very big blessing.” “I want to keep learning. If we are given the opportunity to learn again, I am willing to participate.” Chinese: “These past three months have truly been rewarding since starting the program.” “This is the highest academic achievement I’ve ever had! The most fulfilling learning experience. Thank you so much!” “Because I never studied before, and now I'm just starting to understand a little...I've learned things I didn't understand before...I've benefited a lot.”
<i>Reflections on sustained engagement: Benefits and barriers beyond program completion</i> This theme represents participants’ perceived value	Latinos: 90.0% (9/10) Chinese: 95.0% (19/20)	Latinos: “I’ve tried [to enroll in sewing classes], but it’s very hard, it’s quite difficult. I called two places to go, and no, it’s just too much.” Chinese:

of lifelong learning in maintaining cognitive health while also highlighting barriers that may hinder sustained engagement after the program's completion.		“There aren't any schools like that in Riverside. There might be some closer to Los Angeles, but that's too far.” “[Learning] helps prevent dementia.”
--	--	--

Note. Percentages represent endorsement within each cultural group; * = unique theme found only among one cultural group.

Lessons Learned: Recommendations for Future Learning Intervention

Implementation

The themes that emerged from participants' evaluations of the intervention provide valuable insights that can inform the design and implementation of future learning interventions for underserved older adult populations. Drawing from the barriers and challenges identified by participants, their feedback on the program, and observational field notes, several targeted recommendations can be proposed to enhance the effectiveness and feasibility of similar interventions. These recommendations represent key lessons learned from the study and highlight several areas for improvement, including: 1) tailoring instruction to participants' proficiency levels, 2) increasing accessibility to accommodate age-related sensory limitations, 3) carefully considering the overall duration of the intervention and the distribution of learning activities across weeks, 4) separating classes by language group when implementing multilingual interventions, 5) teaching older adults strategies that support effective learning and help them become more independent learners (e.g., learning how to learn), and 6) incorporating more frequent in-class practice, testing, and quizzing to assess and reinforce participants' learning.

In terms of instructional design, one important lesson learned was the need to better tailor instruction to align with participants' individual proficiency levels. The program was designed with the intention of having all older adults attend the same classes; however, this approach created some challenges, as some participants felt the material was either too advanced or too basic, particularly in the English course. Future

learning programs may benefit from conducting more comprehensive preliminary skill assessments to better identify participants' learning needs and proficiency levels and to group learners into separate classes based on proficiency levels, ranging from beginner to advanced. Doing so could help ensure that participants are able to engage with the learning material at an appropriate level of challenge.

Future instructional design should also adopt a slower pacing structure and provide additional opportunities for review and guided practice during class. Because each class in the program met for only one hour per week, instructional material was sometimes delivered at a faster pace in order to cover planned content. As a result, less time was available for in-class practice and review, and some participants reported feeling that certain topics were rushed. Participants made suggestions that the program should be longer and include more frequent classes throughout the week rather than meeting only once weekly. These observations suggest that future programs may benefit from breaking lessons into smaller segments delivered across multiple days, allowing for repeated exposure to learning materials and additional guided practice to reinforce understanding among older adult learners. The decision to structure classes as one-hour sessions once per week was initially made to minimize potential burden on participants. Because many participants had not engaged in formal learning for a long time, the program was designed to feel manageable and accessible by limiting the expected weekly commitment to approximately three hours. This approach was intended to help participants feel comfortable committing to the program without becoming overwhelmed. However, feedback from participants after completing the program suggested that they

would have welcomed a longer intervention period and more frequent instructional sessions. Some participants expressed that additional time would allow them to better absorb the material and make greater progress in developing the taught skills. For example, one participant suggested that “if it could be six months, that would be better,” indicating that a longer program duration might further support learning and skill development.

In addition to tailoring learning pace and content based on proficiency levels, future programs should also better accommodate older adult participants who may experience age-related sensory limitations. Although participants were asked to report hearing or vision impairments during the screening process, and corrected impairments were considered acceptable for program participation, some individuals later reported experiencing difficulties during the classes. Participants who rely on corrective devices such as glasses or hearing aids may not anticipate challenges in everyday settings because these aids allow them to function relatively well in daily life. However, classroom environments present different demands. Factors such as background noise, group discussions, distance from instructional materials, and small font sizes may make it more difficult for individuals with sensory limitations to fully hear or see instructional content. As a result, impairments that appear manageable in everyday or one-on-one contexts may become more noticeable in group learning environments and can create barriers to engagement. These observations suggest that simply asking participants whether they have corrected hearing or vision impairments may not be sufficient when designing learning interventions for older adults. Future programs may benefit from conducting

more detailed sensory screenings prior to enrollment and implementing classroom accommodations that reduce potential barriers. Such accommodations may include larger printed materials, enhanced visual contrast in presentations, amplification devices, improved classroom acoustics, and intentional seating arrangements. By proactively addressing these factors, programs can help ensure that sensory limitations do not hinder participants' ability to engage fully in the learning experience.

Importantly, when conducting multilingual interventions aimed at increasing inclusion and learning accessibility for older adults who speak different languages, it may be more effective for instructors and participants to organize classes by language group. In our intervention, Spanish-speaking and Chinese-speaking participants were enrolled in the same classes. As a result, instructors delivered instructional content in multiple languages during each session to ensure that all participants could understand the material. Specifically, instructors first explained the content in English and then had assistants translate the content into Spanish and Chinese for participants. Although this approach allowed all participants to access the information, it required repeating content in three different languages within the same limited instructional time. Consequently, a substantial portion of class time was spent on translation rather than instruction and practice. Furthermore, this structure contributed to occasional distractions during class. As identified in one of the study's themes, some participants engaged in side conversations while waiting for translations in their language, particularly during periods when another language was being spoken. These observations suggest that future multilingual learning interventions may benefit from organizing separate classes by

primary language, maximizing instructional time, minimizing classroom distractions, and creating a more focused and structured learning environment for participants.

Another key lesson involves the need to teach older adult participants learning strategies in order to better support their learning process and build confidence to continue learning independently after the program ends. Based on observational data, many participants at the beginning of the intervention were unsure about how to take notes during class, complete homework assignments, or study and review the material. For many, this was their first formal learning experience in many years, making the expectations and strategies of classroom learning unfamiliar. As a result, activities such as completing in-class exercises or practicing through homework initially felt confusing, and some participants struggled to understand what they were expected to do despite clear instructions. Over time, as participants became more familiar with the learning process and materials, they gradually improved in their ability to engage with these activities. However, it took several weeks for some participants to become comfortable with these learning practices, which reduced valuable instructional time. Given these observations, it is recommended that future programs incorporate a preparatory phase prior to the start of classes in which participants are introduced to learning strategies and guided on how to engage with course materials and classroom activities. Providing an in-depth orientation or training period to help participants re-engage with learning may better prepare them for the instructional component of the intervention. These strategies should also be reinforced throughout the program and tailored specifically for older

adults, taking into account potential age-related cognitive changes that may influence learning processes.

To further support learning engagement, the instructional team could also organize optional structured study groups outside of class to assist participants with homework assignments and provide guidance for independent practice. These study groups could follow a scaffolded approach in which instructional support gradually decreases as participants build confidence and independence in their learning. Such support may be particularly beneficial for participants who reported feeling lost when attempting to complete homework on their own at home without guidance.

Lastly, participants expressed a desire for more structured in-class practice of English speaking, as well as additional testing and quizzing to help assess their understanding of the skills being taught. While our intervention incorporated homework assignments and in-class activities to allow participants to practice and apply the material, we intentionally chose not to include formal quizzes, exams, or required speaking exercises. This decision was made to avoid intimidating participants or making them feel uncomfortable, particularly given that many had not engaged in formal learning environments for a long time. We also aimed to minimize peer comparison and performance pressure in order to maintain a supportive and relaxed learning environment. However, participants' feedback suggested that they would have welcomed more structured opportunities for participation and assessment. For example, one participant stated, "My feeling is that, for example, in the English class, after seniors learn the course content, if the teacher assigns them to practice speaking in pairs or groups of three, that

might have a different effect, and I believe it would be beneficial.” Another participant similarly noted, “Regarding improvements, sometimes we need to be pushed to speak in front of others. For example, being encouraged to participate in live discussions. It needs to be a bit stricter.” In addition, participants expressed interest in having quizzes or other forms of brief assessments to reinforce learning. As one participant explained, “During the teacher's lecture, there seems to be a little review at the beginning, reviewing what was said last week, but he didn't conduct a test, a kind of quiz... Of course, having review quizzes is better; it motivates you. If you can't answer or answer incorrectly, it makes you realize that you're less likely to forget the correct answer the second time. Of course, this would prolong the teaching time, which might be a drawback.” This feedback suggests that the instructional team may have underestimated participants' willingness and motivation to engage in more structured forms of practice and assessment in an effort to preserve a safe, low-stakes learning environment. In attempting to create a comfortable and low-pressure learning environment, the program may have inadvertently limited opportunities for participants to further challenge themselves and reinforce their learning through active participation and feedback.

Chapter 5 Summary

This chapter presented the quantitative and qualitative findings from the evaluation of a community-based learning intervention designed for low-income, racial/ethnic minoritized older adults. The quantitative survey results showed that participants rated the intervention highly. The qualitative themes derived from the

semi-structured interviews represented perceived barriers to learning, facilitators that supported their engagement, and the overall value and impact of the intervention.

Findings from the qualitative analyses identified several barriers that participants perceived as affecting their learning engagement. Participants from both cultural groups reported challenges related to navigating differences in skill difficulty, course pace, and varying levels of proficiency among learners. Some participants also experienced health issues and sensory impairments during the program, which at times limited their ability to fully engage in the learning activities. Chinese participants uniquely described age-related memory decline as affecting their ability to retain newly learned information and noted a lack of guidance on how to adapt learning strategies as older adults experiencing cognitive changes. In contrast, Latino participants uniquely identified peer distractions as disruptive to their learning focus, particularly when side conversations occurred during translation periods.

For identified learning facilitators and factors that strengthened participants' engagement, both Latino and Chinese participants highlighted the collaborative efforts between community members (including residential supervisors, social workers, and caregivers) and the research team in supporting and motivating their participation in the intervention. Participants also perceived the program as highly accessible due to its structural design, including the provision of all learning materials and the delivery of classes within their residential community, which helped mitigate transportation and financial barriers. Participants further described how the instructional team fostered a safe and supportive learning atmosphere in which they felt comfortable asking questions and

seeking clarification. Instructors were consistently described as kind and patient, which participants identified as an important factor that motivated and sustained their engagement throughout the program. Peer support also emerged as a key facilitator, as participants often collaborated with one another to review course material, complete homework assignments, and work together during in-class activities. In addition to peer support, participants emphasized the role of family members, particularly children and grandchildren, in encouraging their learning engagement. Participants reported feeling motivated to make their families proud and received assistance with assignments, accountability, and emotional encouragement from them. Finally, some Chinese participants uniquely highlighted the importance of their own resilience and perseverance in sustaining their engagement in the program, a strength that was also present in the experiences of many other participants across both cultural groups.

Regarding the perceived value and overall impact of the learning intervention, Chinese participants specifically described experiencing a shift in their perceptions of the program. While some participants initially expressed skepticism, they reported that their views changed after participating, noting that the program ultimately exceeded their expectations and was highly valued. Both Latino and Chinese participants also discussed how the program strengthened social connections within their community, describing how relationships that were previously neighbor-like evolved into friendships. Participants from both groups further characterized the learning program as a rewarding and empowering opportunity and expressed gratitude for the experience, along with an eagerness to participate in similar programs in the future. In reflecting on their continued

engagement in learning, participants also discussed the potential benefits of ongoing educational opportunities, particularly for maintaining cognitive health and preventing dementia. At the same time, some participants acknowledged potential barriers to continued learning following the conclusion of the program, noting that the intervention had helped mitigate many of the challenges that previously limited their engagement in learning opportunities.

Based on participants' experiences, feedback, and observational field notes, the chapter concluded by outlining several lessons learned that may inform the design and implementation of future learning interventions. These recommendations address key barriers and challenges identified in the study and provide guidance for improving future learning programs. Specifically, the recommendations focus on tailoring instructional design to match participants' proficiency levels, incorporating accommodations for age-related sensory limitations, carefully considering program length, pacing, and the distribution of learning activities across the intervention, addressing challenges associated with multilingual instruction, introducing strategies that help older adults learn how to learn, and incorporating structured opportunities for practice and assessment.

CHAPTER 6

Discussion

Using a mixed-methods approach, this dissertation examined the impact of a community-based learning intervention tailored for low-income Latino and Chinese older adults that taught them two new skills, English and technology, and incorporated motivational discussions on healthy aging. The study assessed the effects of the intervention on participants' cognitive abilities, functional independence, and psychosocial outcomes, and it was hypothesized that participants would experience improvements across all these domains. In addition, the study evaluated the intervention from participants' perspectives, including perceived barriers and facilitators to engagement as well as the overall impact and value of the program. It was hypothesized that participants would identify novel learning barriers and challenges not previously observed in a preliminary study, while barriers intentionally addressed through the intervention's design would be recognized as facilitators or strengths. Finally, it was expected that participants would evaluate the intervention positively and perceive it as a valuable and beneficial learning experience.

The quantitative findings on the effects of the intervention indicated that participants experienced significant improvements in processing speed, functional independence, learning self-efficacy, and aging expectations. Greater cognitive gains were observed among participants who reported higher engagement and were younger. Well-being showed a marginally significant increase, while learning motivation did not change significantly. However, participants with higher engagement did report

significantly greater motivation. Qualitative data further revealed that participants experienced cognitive benefits (e.g., memory improvements), enhanced independence in daily activities, and increased well-being, including a greater sense of purpose, positive emotions, and reduced feelings of isolation. Participants also described heightened motivation to continue learning and increased self-efficacy to learn new skills in later life. Together, the qualitative and quantitative findings offer partial support for the hypothesis that participation in the intervention would lead to improvements in cognition, functional independence, and psychosocial outcomes among participants. Differences between Latino and Chinese participants' experiences, as identified in the qualitative analyses, were also explored.

In evaluating the intervention, participants reported challenges and facilitators that influenced their engagement in learning. Identified challenges included skill difficulty, course pace, a misalignment in content and proficiency level, health and sensory issues, forgetfulness, and distractions. Facilitators encompassed accessible learning resources and environment, resilience and self-perseverance, and support from community leaders, research staff, peers, and family. Overall, the program was highly rated and perceived as promoting greater social connection within their community and as empowering for participants. Participant feedback, alongside observational field notes, highlighted important areas for improvement in future tailored interventions. These findings support the hypothesis that participants would evaluate the intervention positively and identify barriers and facilitators influencing their engagement in the learning process. The

following sections provide a detailed discussion and interpretation of these findings in relation to prior literature.

Impact of the Learning Intervention on Cognitive, Functional, and Psychosocial Outcomes

Cognition, functional independence, and well-being are recognized as key components of healthy aging (Depp et al, 2010; Lawton & Brody, 1969; Rowe & Kahn, 1987; 1997) and have also been identified as important outcomes of learning engagement in later life (Alexandropoulos, 2024; Chan et al., 2016; Nguyen et al., 2020; Shapira et al., 2007; Wu et al., 2017). Engagement in learning during older adulthood may also influence other psychosocial factors that shape older adults' continued participation in learning and their aging experiences. In particular, learning motivation, learning self-efficacy, and aging expectations have been examined as predictors of engagement but have less frequently been assessed as outcomes of learning interventions for aging populations. Moreover, studies examining the impact of learning on older adults have been primarily conducted with White and middle-to-high income participants. As such, the present study addressed these gaps in the literature by examining how participation in a learning intervention impacts cognition, functional independence, and psychosocial outcomes among an underserved population (low-income Latino and Chinese older adults). The quantitative and qualitative findings related to each of these outcomes are discussed below.

Cognitive Outcomes

The quantitative findings on cognitive outcomes, including global cognition and specific domains such as processing speed, working memory, and cognitive control, partially align with prior research demonstrating that learning engagement benefits cognitive functioning in older adulthood. Participants experienced significant improvements in processing speed from before to after the intervention. These findings are consistent with previous learning intervention studies showing that learning new skills (e.g., new technology, music training) increases processing speed in older adults (Bugos & Wang, 2022; Chan et al., 2016). Processing speed is considered as a foundational domain of the cognitive system given that it has been found to support performance across multiple cognitive domains and influences the execution of everyday tasks (Kail & Salthouse, 1994; Nolin et al., 2025; Wadley et al., 2021). Additionally, processing speed is associated with more resilient cognitive aging in later life (Ticha et al., 2023), making the observed improvements in this domain especially impactful.

In contrast to prior interventions (e.g., Leanos et al., 2023; Noice et al., 2004; Park et al., 2014), there were no significant improvements from pre-test to post-test for global cognition, working memory, and cognitive control. Observed gains in processing speed but not across these other domains may reflect differences in how the learning experience may have affected some cognitive domains more readily than others. It is possible that global cognition, working memory, and cognitive control require longer or more intensive engagement to produce measurable change. Additionally, pre-intervention analyses revealed significant or marginally significant practice effects on several cognitive measures, indicating that participants showed some improvements on these

tasks even before the learning intervention began. Practice effects are common in cognitive research, representing how familiarity, test-taking strategies, or repeated engagement with similar tasks influence performance (Bartels et al., 2010). Accounting for these practice effects allows for a more cautious interpretation of the results, as any observed changes may reflect a combination of intervention effects and repeated testing.

Although there was no significant effect of time alone across global cognition and most cognitive domains, the results suggest that cognitive gains across time were contingent on individual differences in degree of self-perceived engagement and age. Global cognition assessed with the BTACT was predicted by a significant interaction between time and self-perceived engagement, indicating that participants who reported higher engagement in the intervention experienced greater cognitive gains from pre-test to post-test. A similar pattern was observed for processing speed, where participants with higher engagement demonstrated better processing speed performance over time. Furthermore, for global cognition assessed with TabCAT, higher engagement predicted higher cognition, and a significant interaction between time and age indicated that older participants experienced smaller gains in cognition from pre-test to post-test than younger participants. Engagement also significantly predicted higher working memory scores and was marginally associated with greater cognitive control.

These results underscore the important role that engagement played in the intervention regarding cognitive outcomes. Greater participation and investment in the learning process involve more effort, attention, and persistence to try and master new learned skills, which requires higher cognitive effort, and in turn, provides greater

cognitive stimulation. This mechanism, in which increased cognitive effort leads to greater cognitive gain, aligns with research on academic achievement and cognition, showing that higher academic performance (reflecting greater effort and sustained engagement) is associated with higher cognitive functioning (e.g., Greene et al., 2018; Peng & Kievit, 2020; Shi & Qu, 2022). Learning new skills is most beneficial for cognition when individuals are able to maximize their degree of engagement. These findings also support theories of cognitive engagement, particularly the theory of adult intellectual development (Ackerman, 1996; Von Stumm & Ackerman, 2013), which posits that cognitive abilities develop through the active investment of effort in intellectually demanding activities. Thus, merely attending or participating in a learning intervention may be insufficient to produce cognitive changes unless it is accompanied by substantial cognitive effort and investment. Understanding the factors that influence participants' level of engagement is therefore critical. The qualitative themes regarding participants' evaluation of the program provide additional insights into these potential factors, which are discussed in a later section.

Aside from engagement, higher educational attainment consistently predicted better performance in working memory, processing speed, and global cognition, whereas older age was associated with lower global cognition and cognitive control. These findings are consistent with prior research showing a strong link between educational attainment and cognitive function in later life (Chen et al., 2019; Fletcher et al., 2021; Lövdén et al., 2020; Walsemann & Ailshire, 2020), as well as the association between aging and cognitive change (Glisky, 2007; Harada et al., 2013; Lezak et al., 2012; Luszcz

& Bryan, 1999). Considering age and educational background as factors that have an effect on cognitive outcomes is important for understanding how cognitive performance may vary across individuals.

Regarding the qualitative data findings, participants across Latino and Chinese groups described cognitive benefits from participating in the intervention, noting improvements in memory, information processing, and overall mental agility, captured through the theme *An awakening of the mind and memory through stimulating engagement*. Participants described actively “exercising” their minds through learning activities, completing assignments, and recalling information, which they perceived as strengthening their cognitive abilities in daily life. These narratives complement the quantitative findings, reinforcing the importance of engagement for cognitive outcomes. Moreover, participants’ descriptions of improved cognition in everyday activities highlight real-world benefits of the intervention that may not be fully captured by standardized cognitive assessments. These reported improvements are consistent with prior qualitative research showing that older adults perceive subjective memory and overall cognitive benefits after engaging in cognitively stimulating interventions (e.g., Nguyen et al., 2025). Overall, the findings highlight that cognitive engagement through learning not only enhances performance on objectively measured cognitive tasks but also supports participants’ subjective experience of improved cognitive capabilities in older adulthood.

Functional Independence Outcomes

The quantitative findings indicated that participants' functional independence in activities of daily living significantly improved from before to after the intervention. Significant improvements were also observed for online activities of daily living. These results suggest that participation in the learning intervention may have increased participants' ability to manage everyday tasks more independently in typical and digital contexts. Functional independence is a key component of healthy aging because it enables older adults to maintain autonomy and a higher quality of life (Lawton & Brody, 1969). Many interventions aimed at preventing functional decline and increasing independence in older adulthood have primarily focused on physical movement or exercise (e.g., functional strength training; Brogno, 2025; Courtney et al., 2012) or on maintaining existing levels of functioning rather than promoting improvements (Beswick et al., 2008; Nguyen et al., 2018). As such, the present findings contribute to a growing body of research demonstrating that learning-focused interventions can also support functional independence among older adults (Chan et al., 2016; Leanos et al., 2023; Nguyen et al., 2018). Learning technology-related skills may be especially relevant, as digital tools are increasingly recognized as essential for helping older adults maintain independence in everyday life in an era of widespread digitization of everyday services (Lindeman, 2017; Mynatt & Rogers, 2001; Requena et al., 2024).

The qualitative findings help contextualize the observed quantitative improvements in functional independence through the identified theme *Growth in English and technology skills as a pathway to increased independence in daily life*. Participants from both the Latino and Chinese groups described experiencing increased

independence in daily activities as a result of the program, particularly in relation to using English and technology. Many participants reported feeling more capable of completing tasks that previously required assistance from others, such as communicating with service providers, navigating digital tools, or accessing online resources. Because the skills taught in the intervention were practical and directly applicable to everyday life, a point participants themselves frequently noted, they were relevant in supporting independence in daily functioning. These experiences shed light on how learning new skills with direct real-world impact can translate into improvements in everyday functioning.

The qualitative data also revealed the impact of the motivational discussion sessions on participants' independence outcomes. For example, one Latino participant described how the topic of one of the motivational discussions, focused on autonomy, gave her the confidence to tell her daughter, who also attended the classes with her, that she wanted to be allowed to do more things independently. Previously, her daughter, who also served as her caregiver, would complete tasks for her with the intention of being helpful, but the participant felt that this limited her sense of independence. After participating in the program, she felt empowered to express her desire to regain greater autonomy in her daily activities, and her daughter supported this change. This example shows how independence in later life is not only influenced by individual capability but also by the behaviors and expectations of family members and caregivers. Family members play a central role in caregiving and decision-making within many Latino and Asian families, which contributes to how autonomy and support are negotiated in later life. These dynamics are reflected in cultural values such as *familism* among Latino

populations (Ruiz & Ransford, 2012; Savage et al., 2016) and *filial piety* within Asian cultures (Xiao et al., 2024; Yu & Fang, 2022). Familism emphasizes strong family interconnectedness and the expectation that family members provide support and care for one another as a duty and out of love (Sabogal et al., 1987), while filial piety reflects obligation, respect, and responsibility for caring for older family members (Bedford & Yeh, 2019; Ho, 1996). Within these cultural frameworks, family members may feel a strong responsibility to assist older relatives with daily activities, which can sometimes result in protective behaviors that unintentionally limit opportunities for older adults to exercise their independence.

Prior work has pointed out the tension that can exist between protecting older adults and preserving their autonomy, emphasizing the importance of balancing safety with independence in caregiving relationships (Marnfeldt & Wilber, 2025). Thus, interventions that aim to promote independence among older adults may benefit from engaging not only the participants themselves but also the family members or caregivers who support them. Involving these individuals in the intervention process may help ensure that efforts to enhance independence are supported at multiple levels, creating environments that enable older adults to exercise their abilities and increase autonomy in their daily lives.

Well-Being Outcomes

The findings showing a marginal increase in well-being contrast with prior studies that have documented significant associations between learning participation and well-being among older adults (Fang & Sim, 2024; Jenkins & Mostafa, 2015; Noice et

al., 2004; Perkins & Williamon, 2014; Shapira et al., 2007). Nonetheless, the qualitative themes reflect participants' perceived improvements in well-being through their participation in the intervention. Participants from both the Chinese and Latino groups described their learning experience as a driver of purpose, fulfillment, and positive emotion. Engaging in learning provided them with something meaningful to look forward to, helped them achieve lifelong learning goals, and generated feelings of happiness and joy. Some participants also described the program as an opportunity to escape from isolation and everyday struggles, such as health-related discomfort, loneliness, or emotional distress, frequently emphasizing the social aspects of the intervention. These experiences are consistent with prior research suggesting that participation in learning activities can enhance well-being among older adults by promoting social engagement, inclusion, and the pursuit of personally meaningful goals (Feinstein et al., 2004; Findsen & Formosa, 2011; Hachem et al., 2017; Joseph & Human, 2020; Liu et al., 2023; Maulod & Lu, 2020; Suyono, 2021). The findings also support the activity theory of aging, which proposes that continued engagement in purposeful activities during older adulthood contributes to greater well-being (Havighurst & Albrecht, 1953; Havighurst, 1961).

A third well-being theme emerged uniquely among Chinese participants, who described feeling more youthful as a result of engaging in intergenerational learning and interacting with younger individuals (the research and instructional team). Intergenerational learning has been shown to benefit younger and older individuals (Gualano et al., 2018; Murayama et al., 2015; Pstross et al., 2017), and in this case, Chinese participants specifically identified feeling younger as a beneficial outcome of

spending time with younger people. Feeling younger than one's chronological age has been associated with a range of positive outcomes, including greater well-being, better cognitive functioning, and improved physical health (Choi & DiNitto, 2014; Stephan et al., 2018; Westerhof et al., 2014). It has also been found to buffer stress and declines in functional health (Wettstein et al., 2021). Thus, the sense of youthfulness reported by participants may represent an important psychosocial benefit of the intervention, suggesting that intergenerational learning environments can contribute to a shift in subjective age among older adults.

Learning Motivation Outcomes

Quantitatively, learning motivation did not significantly increase from before to after the intervention. However, engagement in the intervention was a significant positive predictor of motivation, suggesting that participants who were more engaged in the learning process reported higher learning motivation. Interestingly, educational attainment negatively predicted learning motivation, indicating that people with higher education had lower learning motivation. This finding contradicts prior work showing a positive relationship between education and motivation to learn (e.g., Chang & Lin, 2011). A possible explanation is that individuals with higher educational attainment may have had greater access to learning opportunities earlier in life and, as such, may have perceived the intervention as less novel or transformative, making them feel less excited or motivated to learn. In contrast, participants with lower levels of education may have viewed the program as a more valuable and unique opportunity for learning that they had not previously experienced, leading to greater learning motivation. This interpretation

most closely resembles the scarcity principle proposed by Cialdini (1993), which states that individuals tend to place greater value on opportunities that are perceived as rare or limited. It could also be reflected by the concept of hedonic adaptation, which proposes that individuals become accustomed to repeated experiences over time, leading those experiences to have a diminished emotional impact (Brickman & Campbell, 1971).

Through this lens, participants with higher education may have been more accustomed to engaging in structured learning opportunities, resulting in a reduced sense of novelty and, consequently, lower motivational impact. On the other hand, the opposite effect may have occurred among participants with fewer prior educational experiences.

Although learning motivation did not significantly increase in the quantitative analyses, the qualitative findings provide important insight into participants' lived experiences. It is plausible that the lack of significant quantitative change among participants is due to participants reporting relatively high levels of motivation prior to the intervention, leaving limited room for measurable improvements. The qualitative data suggest that Latino and Chinese participants' motivation grew in ways that were not fully captured by the survey measure. The theme *From claimed to embodied motivation: Uncovering a greater desire for continued learning* reflects how participants went from initially perceiving themselves as motivated to developing a deeper desire and commitment to learning. Through experiencing learning as part of the program, participants seemed to discover a more tangible form of motivation. This finding highlights the value of employing a mixed-methods approach when assessing outcomes (Creswell & Clark, 2007; 2017; Curry et al., 2009; Tashakkori et al., 2013). While

quantitative measures serve as important standardized assessments, they may not fully capture nuanced shifts in how individuals experience and express motivation. In this case, the qualitative data revealed changes in participants' motivation that were not shown in the quantitative results. Together, these findings suggest that learning motivation should be conceptualized not only as a predictor of engagement in learning activities (Chang & Lin, 2011; Li et al., 2025; Xiong & Zuo, 2019; Yamashita et al., 2019; Yi-Yin, 2011) but also as an outcome that can be strengthened through learning participation.

Learning Self-Efficacy Outcomes

Learning self-efficacy significantly increased from pre-test to post-test, suggesting that participants gained greater confidence in their ability to learn. Similar to the findings for learning motivation, higher educational attainment was associated with lower self-efficacy. Perhaps individuals with higher levels of education may be comparing their current learning abilities to their past performance earlier in life, when cognitive functioning and learning capacity may have felt stronger. Such comparisons may lead to lower perceived confidence in their present ability to learn. In contrast, participants with lower levels of education may have had fewer prior opportunities for structured learning and, thus, fewer points of comparison. For these individuals, successfully engaging in the program may have represented a novel and more impactful experience, resulting in a greater perceived learning capability.

The qualitative findings further support this interpretation. Latino participants, who, on average, had lower levels of educational attainment than Chinese participants, uniquely represented the theme *Learning engagement as proof of capability*: “If I can do

this, I can do more!” in their interviews. Notably, this theme emerged spontaneously, as participants were not directly asked about self-efficacy or confidence in learning. The theme captures how participants developed greater confidence in their ability to learn as a result of successfully engaging in the program, with their participation serving as concrete proof of their capability. There are several possible explanations for why this theme was not similarly emphasized among Chinese participants. First, self-efficacy was not explicitly probed in the interviews, and thus may not have been as readily articulated. Second, given their higher levels of educational attainment, Chinese participants may have already had more established perceptions of their learning competence, making changes in self-efficacy less salient in their narratives. In contrast, for Latino participants, this experience may have represented a more novel realization of their learning potential.

Overall, these findings demonstrate that learning self-efficacy can be strengthened through engagement in learning activities, rather than serving solely as a predictor of participation (Phipps et al., 2013), as is commonly utilized in health and behavioral interventions (e.g., Jalali et al., 2025; Tavakoly Sany et al., 2024; Yang et al., 2021). The results also align with prior research demonstrating that engagement in learning opportunities in adulthood can enhance self-efficacy (Dong et al., 2023; Laganà et al., 2011; Lozoya et al., 2022), particularly among individuals with lower educational backgrounds (Hammond & Feinstein, 2005). This is especially important given that older adults often report lower confidence in their ability to learn, in part due to internalized age-related stereotypes (Dunlosky & Hertzog, 1998; Rodriguez et al., 2025a). By providing opportunities for successful learning experiences, interventions such as this one

may help challenge these beliefs, foster a higher sense of capability, and open a new desire to try new things without limitations driven by fear of failure or low perceived competence. Increased self-efficacy may specifically encourage continued engagement in learning, as confidence in one's ability to learn is known to influence learning motivation (Schunk, 1995; Zimmerman, 2000).

Aging Expectations Outcomes

Aging expectations, which were only assessed quantitatively, significantly improved from pre-test to post-test, suggesting that participation in the intervention may have positively influenced how participants perceive the aging process. The interview protocol did not explicitly include questions related to aging expectations and no specific qualitative themes were identified for this outcome. Nonetheless, participants' narratives across interviews corroborate this finding. In particular, themes reflecting participants' gains in learning confidence and motivation, along with reported improvements in purpose and emotional well-being, suggest that participants experienced a shift toward more optimistic and empowered views of aging. Collectively, the significant improvements in learning self-efficacy and aging expectations provide support for the transformative learning theory, which posits that adult learning offers opportunities for individuals to experience personal growth and reframe existing expectations or beliefs, extending the benefits of learning beyond skill acquisition (Mezirow, 1991; 1995; 1997).

The observed shift in aging expectations may have been partially influenced by the motivational discussion sessions, which presented aging in a positive light and emphasized that growing older is not synonymous with decline. One aim of these

sessions was to mitigate ageism and promote positive views of aging by providing older adults with strategies for maintaining cognitive, physical, and social well-being to age healthily. The learning intervention implemented similar approaches used in interventions intentionally designed to improve aging attitudes (e.g., Burnes et al., 2016; Sabatini et al., 2025; Whatley & Castel, 2020; Zhu et al., 2025). These findings suggest that integrating discussions on positive aging into learning programs may enhance their psychosocial impact, helping participants stay motivated and adopt more optimistic expectations of aging. Fostering positive expectations of aging is crucial to aging well, as individuals' beliefs can influence aging outcomes through the internalization and embodiment of age-related stereotypes (Levy, 2009; Tully-Wilson et al., 2021; Yao, 2020). Levy and Myers (2004) found that more positive self-perceptions of aging predicted greater engagement in preventive health behaviors. Conversely, lower aging expectations are associated with reduced participation in health-promoting activities (e.g., physical activity), which may contribute to poorer health outcomes (Sarkisian et al., 2005a).

Evaluation of the Learning Intervention

Evaluating the implementation of interventions is necessary, particularly when conducted in real-world community settings. Assessing interventions from the perspective of the participants provides social validity, a concept highlighted in the Positive Behavior Support (PBS) framework on intervention design (Carr et al., 2002). Social validity helps determine the practicality, relevance, and effectiveness of an intervention from the participants' point of view, the perspective that ultimately matters when deciding whether an intervention is worthwhile. Moreover, systematic evaluation

supports replicability and scaling, informs the design of future interventions, and contextualizes outcomes (Bhana & Govender, 2010; Denford et al., 2017; Gitlin & Czaja, 2015; Monsen, 2018; Rychetnik et al., 2002; Steckler & Linnan, 2002). Therefore, the current study assessed participants' evaluations of the learning intervention. Quantitative findings indicated highly positive evaluations, with mean scores near the upper end of the scale, reflecting strong satisfaction with the program. Although Latino participants reported slightly higher ratings, no significant cultural group differences were observed, suggesting that the program was favorably received across both cultural groups. Qualitative findings on learning barriers, facilitators, and perceived value and impact are discussed below.

Learning Barriers and Challenges

The intervention was designed to intentionally mitigate previously identified barriers to learning engagement among underserved older adults based on a preliminary qualitative study, which included limited awareness of learning opportunities, uncertainty about what to learn, lack of reliable transportation, low English language proficiency, cost and time constraints, and low motivation (Rodriguez et al., 2025a; Rodriguez et al., 2022). As hypothesized, despite efforts to address and minimize learning engagement barriers through the tailored, community-based learning intervention, participants still encountered challenges that, at times, affected their engagement.

One key challenge was navigating skill learning difficulties, stemming from a misalignment between the instructional content and pace of the classes and the varying proficiency levels of participants across both cultural groups. Difficulties in keeping up

with the learning pace among older adult learners has been previously identified as a constraint (Leung et al., 2006). Some participants in the study perceived the learning content as either too difficult or too easy, and both experiences negatively affected their engagement at times. Participants who perceived the material as too easy reported feeling bored or uninterested, as they believed they were not gaining new knowledge, whereas those who perceived the material as too difficult felt overwhelmed and struggled to keep up with the pace of the classes. This pattern is consistent with the Yerkes-Dodson Law, which posits that optimal performance and engagement occur at moderate levels of challenge, whereas tasks that are too easy or too difficult can lead to decreased motivation and performance (Yerkes & Dodson, 1908).

These identified differences in perceived difficulty may partially explain why cognitive improvements were not consistently observed from pre-test to post-test and were contingent on participants' engagement levels. For some participants, the learning content was either too challenging or too easy, which not only limited the potential for cognitive change but also affected their engagement in the program. Consequently, participants whose learning engagement was higher, because the learning content was better matched to their abilities, experienced greater cognitive gains. Overall, optimizing instructional design is an ongoing challenge in educational contexts, and it may be particularly difficult to manage among older adult learners given their diverse levels of experiences and varying levels of prior exposure to formal learning. These differences lead to high variability in learning needs and preferences. As such, assessing prior knowledge to inform individualized instructional design strategies could yield improved

learning experiences by properly matching the challenge level to the older adult's learning potential (e.g., Hailikari et al., 2008; Kuldass et al., 2014).

Changes in cognitive functioning as individuals age also have important implications for instructional design and pacing. For example, older adults may experience age-related changes in memory and information processing systems, which can affect learning in older adulthood (Park & Schwarz, 2012; Sharit & Czaja, 2020). This challenge was specifically described in a theme uniquely brought up among Chinese participants, which highlighted age-related memory declines as a barrier to remembering and retaining learned information, often comparing their learning abilities to when they were younger. Although Chinese participants were the only group to explicitly raise this theme in their interviews, this does not imply that Latino participants did not experience the same challenge. Informal conversations with Latinos suggested that they too had concerns about their memory and learning as older adults. One possible reason for the prominence of this theme among Chinese participants is that their higher educational attainment and cultural emphasis on formal learning may make them more attuned to self-reflection on their learning processes, particularly when comparing their past to their present learning experiences. These participants expressed a desire for guidance on how to learn more effectively as older adult learners, noting that they would have benefited from being taught specific strategies to enhance memory and retention. This finding highlights the importance of intentionally teaching older adults how to learn through the incorporation of learning strategies tailored for older adult learners, which echoes the

literature on lifelong learning (Czaja & Sharit, 2016; Sharit & Czaja, 2020; Sheffler et al., 2021; Wolfson et al., 2014).

Even when age-related changes and declines occur in the brain, the scaffolding theory of aging and cognition (STAC) states that older adults can adapt by engaging alternative neural pathways and compensatory mechanisms to maintain cognitive functioning (Park & Reuter-Lorenz, 2009). This perspective suggests that age-related declines should not be interpreted as an inability to learn and that older adults can indeed remain effective learners, especially when supported with strategies that align with their adaptive cognitive processes. Integrating metacognitive approaches may be particularly relevant in supporting more effective learning retention among older adults, which involve increasing learners' awareness of their own learning processes and equipping them with strategies such as rehearsal, organization, and self-monitoring (Bailey et al., 2010; Cornford, 2002; Dunlosky & Metcalfe, 2009; Franklin et al., 2018; Hacker et al., 2009; Sella et al., 2023; Sheffler et al., 2021).

Another identified challenge, that Latino participants uniquely discussed, was peer distractions as a barrier to maintaining focus during the classes. Although Chinese participants did not explicitly mention this in interviews, observational field notes indicated that peer distractions also occasionally affected their engagement. Peer distractions in group learning environments have been previously documented as factors that can reduce attention, disrupting learning and impacting performance (Forrin et al., 2021; Frisby et al., 2018). In the context of our multi-lingual intervention, these distractions were likely amplified by the presence of translation periods, which would

lead to side conversations among participants when their language was not the one being spoken. This finding stresses a key consideration in designing group-based learning for older adults who speak different languages within the same environment, that is, while social interaction can promote peer support and collaborative learning (e.g., Alzubi et al., 2024; Xie, 2011; Wolfe et al., 2023), it can also introduce competing cognitive demands when participants are navigating multiple languages during instruction. From the perspective of cognitive load theory, which proposed that individuals have a limited cognitive processing capacity, these additional demands may overload learners' mental resources and interfere with the learning process (De Jong, 2010; Sweller, 1988; Van Merriënboer & Sweller, 2005).

For older adults, who may already be experiencing age-related declines in selective attention and working memory, distractions in the learning environment can be particularly detrimental, potentially reducing the efficiency of learning (Rodrigues & Pandeirada, 2015). Older adults have a decreased ability to inhibit information that is irrelevant, making them more easily susceptible to be negatively affected by distractions (Andrés et al., 2006; Healey et al., 2008; Weeks & Hasher, 2014). Hence, careful instructional planning is necessary to balance the benefits of social engagement with strategies to minimize avoidable distractions. Examples include organizing separate classes based on language to reduce the need for translation periods or implementing structured communication protocols during translation to maintain learning focus.

Lastly, some Latino and Chinese participants faced health and sensory challenges that would at times limit their engagement in learning. Health-related problems and

sensory declines (e.g., hearing and vision impairments) in older adults have been previously identified as barriers to engagement (Hosnjak et al., 2020; Leung et al., 2006; Purdie & Boulton-Lewis, 2003; Rodriguez et al., 2025a; Scott et al., 2023). Although such challenges are not always feasibly modifiable within the context of learning interventions, there are ways in which programs can support participants by incorporating flexibility and appropriate accommodations to enhance accessibility. For instance, age-friendly instructional design that includes the use of larger print materials, clear audio delivery, assistive technologies, and adaptable pacing to accommodate diverse sensory, physical, and cognitive needs can enhance learning accessibility for older adults (e.g., Ahmad et al., 2022; Rodriguez et al., 2025b; Xu et al., 2025; Williams van Rooji, 2012). Providing flexibility, such as allowing additional time for task completion, offering repeated instruction, and creating opportunities for individualized support, can also help mitigate the impact of health- and sensory-related barriers on engagement. The intervention aimed to incorporate many of these strategies, but participants' experiences suggest that fully addressing these challenges remains complex in practice, highlighting the need for continued refinement of these components in future implementations.

Importantly, the identified barriers did not result in substantial attrition. Of the 42 participants originally enrolled, only one withdrew after the second week of the intervention, while two others completed the entire program but were unable to participate in post-test data collection due to health-related issues. Most of the challenges described by participants were intermittent barriers to learning engagement rather than barriers that prevented continued participation altogether. This observation suggests that

the intervention was largely successful in mitigating structural barriers to participation and in supporting sustained engagement among participants. Thus, although not all barriers can be fully eliminated through intervention-based approaches, learning interventions may still be effective when they aim to reduce barriers to a level that at least enables participants to remain engaged and benefit from the experience. The effectiveness of learning interventions for older adults may lie not in the complete elimination of all barriers (as this is unrealistic), but in the removal of modifiable barriers alongside the strategic management of those that cannot be easily mitigated.

Learning Facilitators and Strengths

Understanding the factors that facilitate learning engagement, those that enable or strengthen participation, is as important as identifying barriers when designing effective interventions for older adults. However, the literature has predominantly focused on identifying barriers, with less attention given to the factors that facilitate and foster engagement beyond the removal of those barriers (e.g., Alexandropoulos, 2024; Conesa et al., 2023; Günen et al., 2023; Laal, 2011; van Kampen et al., 2023; Van Nieuwenhove & De Wever, 2024). Examining facilitators and identifying strengths provides insight into the mechanisms that support sustained engagement and enhance participants' learning experiences. In the present study, participants identified several facilitators of their engagement, primarily related to receiving support, having accessible learning materials and classes, and demonstrating resilience. These facilitators are discussed below.

Participants from both cultural groups noted the importance of support from their community in facilitating their learning engagement. This support was made possible

through collaboration between community leaders (e.g., residential coordinators, supervisors, social workers, caregivers) and the research team. Participants described how community leaders actively sought out beneficial opportunities and made necessary adjustments to host the intervention within their residential setting, ensuring accessibility and feasibility. They also highlighted the supportive role of the research team, noting that the collaborative and coordinated partnership between researchers and community stakeholders contributed to their engagement. These findings exemplify and highlight the importance of community-based collaboration in the implementation of intervention research in psychology (Collins et al., 2018). Intentional and strong partnerships, in which the priorities of both researchers and community stakeholders are aligned and integrated, can enhance feasibility, accessibility, and participant engagement (e.g., Castillo et al., 2019; Jagosh et al., 2012; McNeish et al., 2019). Such collaborative approaches help create effective interventions for underserved older adults that are responsive to community needs while providing the structural and interpersonal support necessary for sustained participation (Bekteshi et al., 2024; Jagosh et al., 2012; Marchant et al., 2025).

Participants also mentioned how the structural design of the intervention enhanced accessibility to the learning program. By hosting the sessions within their residential community and providing all necessary materials at no cost, the intervention effectively reduced structural barriers such as financial constraints and transportation limitations. Addressing these previously identified barriers (Rodriguez et al., 2025a) through a tailored, community-based approach supports how providing the resources and

mitigating learning obstacles can facilitate and increase accessibility to learning engagement among underserved older adults (Rodriguez et al., 2022).

Besides the learning accessibility through the collaborative support between community partners and the research team, participants from both cultural groups also identified the support from instructors, peers, and family members as facilitators of their engagement in the learning program. Regarding instructional support, participants described the learning environment as safe and welcoming, stating that instruction was delivered with clarity, patience, and kindness. They perceived the instructional team as attentive to their needs, which fostered comfort and sustained participation. Prior research suggests that supportive instructional practices are critical for promoting engagement among older adult learners, emphasizing patience as a key factor (e.g., Czaja & Sharit, 2016; Flauzino et al., 2020; Russell, 2006; Sharit & Czaja, 2020; Sturm et al., 2023). Peer support also emerged as an important facilitator, with participants describing how peers provided assistance with learning tasks, accountability, and encouragement to remain engaged. This aligns with existing research demonstrating that peer interactions and support play a central role in adult learning environments by enhancing motivation and persistence through collaborative learning (e.g., Alzubi et al., 2024; Boudioni et al., 2007; Castro Rojas, 2021; Figueiredo et al., 2025; Xie, 2011; Wolfe et al., 2023).

Family support further contributed to participants' engagement. Participants shared that children and grandchildren assisted with assignments, cheered their participation, and expressed pride in their efforts, which served as a source of learning motivation. In many cases, this support reflected a reversal of traditional intergenerational

roles, with younger family members supporting older adults' learning. Support is more commonly conceptualized in the literature as flowing in the opposite direction, with older adults facilitating the learning of younger family members (e.g., grandparents supporting grandchildren's learning; Alonso Ruiz et al., 2024; Kenner et al., 2007; Strom & Strom, 1995). This reversal shows the reciprocity of intergenerational relationships in family systems and indicates that family-based support can facilitate learning engagement across the lifespan, rather than being limited to only younger learners. Importantly, prior work suggests that the absence of family support, or discouraging attitudes from family (e.g., expressing disapproval of learning in older adulthood), can function as a barrier to learning participation (Hosnjak et al., 2020; Rodriguez et al., 2025a). These findings show the multidimensionality of interpersonal support in facilitating learning engagement among older adults, as it can originate from various sources.

Another theme reflecting a strength of participants' learning experience was the role of resilience and self-perseverance. Participants described demonstrating determination and commitment to the learning process despite encountering challenges. This resilience served as an internal power that enabled participants to remain engaged in the learning program. Although this theme was explicitly articulated by some Chinese participants only, observational data and off-audio conversations suggest that it was also applicable to the majority of participants from both cultural groups. These findings relate closely to the research on academic resilience, which has been documented as a factor that enhances learning engagement and achievement among learners, though more commonly studied among younger populations (e.g., Borman & Overman, 2004;

Radhamani & Kalaivani, 2021; Steel et al., 2024; Yang & Wang, 2022). Within an educational context, resilience is defined as learners' ability to persist and perform despite adversity or challenges (Wang et al., 1994; Wangqiong et al., 2021). Resilience among participants in the present study may help explain why several of the identified barriers were temporary disruptions rather than definitive barriers leading to attrition. Even though structural and interpersonal support are essential for facilitating learning engagement, individual-level strengths such as resilience may serve as key mechanisms for continued learning participation in older adulthood. Thus, it is fundamental that learning interventions not only reduce external barriers to participation but also focus on recognizing and building upon participants' existing strengths. Incorporating strategies that foster resilience may further boost the effectiveness of learning interventions for underserved older adults.

Perceived Value and Impact of the Intervention

Participants' perceived value and impact of the learning intervention were expressed through four main themes. First, Chinese participants specifically described a notable shift in how they perceived the program over time. Prior to engagement, some participants reported having low expectations or skepticism toward the intervention, including uncertainty about the intentions of the research. However, following participation, they expressed a greater appreciation for the program, often describing it as more beneficial and meaningful than they had initially anticipated. This shift seemed to be related to the development of trust, which grew among these participants upon realizing that the intention of the learning program was to be genuinely responsive to

their needs displayed through the care shown by the research team. This finding aligns with literature emphasizing that trust is a key factor influencing engagement and the perceived value of research interventions in community-based work, particularly among underserved and historically marginalized populations (e.g., Bekteshi et al., 2024; Harb & Taylor, 2024; Marchant et al., 2025). Initial skepticism or mistrust toward research is not uncommon among racial/ethnic minoritized individuals, which may be rooted in prior experiences of exclusion, lack of transparency, or misalignment with community needs (Harb & Taylor, 2024; Tran et al., 2025). Hence, building trust through collaborative relationships with communities should be a priority in the design of interventions.

The second theme reflecting participants' views on the impact of the intervention was its role in transforming their community from a group of neighbors into a network of friends. Participants described how the program created a shared space for social interaction and mutual support, allowing them to connect with one another in more meaningful ways through the process of learning together. This transformation represents the benefit of social connection derived from engaging in group-based learning opportunities. These results support prior research suggesting that social connectivity is a beneficial outcome of participating in learning programs in older adulthood (Feinstein et al., 2004; Findsen & Formosa, 2011; Joseph & Human, 2020; Merriam & Kee, 2014; Suyono, 2021). Social connectedness is a predictor of well-being in later life (Ermer & Proulx, 2019; Seppala et al., 2013; Waite et al., 2014). Therefore, the social benefits of the learning intervention and their impact on well-being among older adults showcase the

need to design programs that go beyond skill development to also provide opportunities for social interaction and connection.

The third theme consisted of participants' perceptions of the learning intervention as a rewarding and empowering experience, particularly among those who had limited access to education earlier in life. For many, the program represented a valuable opportunity to engage in learning that had not been available to them in their younger years. Participants expressed appreciation for the experience and a strong desire to participate again in similar programs, suggesting that the intervention was successfully implemented and well-received by participants. Learning engagement is recognized as having an empowering impact among older adults in prior work (Glendenning, 2004; Maulod & Lu, 2020; Merriam & Kee, 2014; Wong et al., 2014). The present findings further suggest that the empowering effects of learning may be more pronounced among individuals with lower educational attainment, for whom such opportunities may carry greater personal significance. Nonetheless, participants with higher educational backgrounds also reported valuing the opportunity to re-engage in formal learning after many years, indicating that the perceived value of lifelong learning spans across different educational levels.

As the fourth and last theme, in evaluating the intervention, participants reflected on their ability to continue engaging in learning beyond the intervention completion. Both Chinese and Latino participants noted the importance of lifelong learning for maintaining cognitive health, yet they also identified potential barriers that could limit continued engagement. These barriers were addressed during the program but

participants felt that they would persist afterward, including transportation, financial, and language barriers. These findings illuminate an important gap to be tackled by research and policy: tailored learning interventions that temporarily mitigate barriers do not fully resolve the structural challenges that continue to limit underserved older adults' access to learning opportunities in the outside world. At the research-level, interventions should not only provide immediate access to learning opportunities but also equip participants with tools, guidance, and connections to other learning programs that can facilitate ongoing learning after its conclusion. At the policy-level, more accessible learning programs should be created to support long-term learning engagement among underserved older adults (Rodriguez et al., 2022; Rodriguez et al., 2025a). While the intervention introduced older adults to technology-based learning platforms (e.g., Duolingo, online educational resources) in the hopes of fostering continued learning practices, some participants indicated that they might lack the motivation to continue learning independently without structured, in-person support. This observation highlights a critical consideration for future program design, which is that older adults may require constant guidance, encouragement, and scaffolding to motivate them to engage in learning. As such, the creation of learning programs across communities for older adults that offer sustained instructional guidance is imperative.

Theoretical Implications

The findings from this study provide important insights for refining and expanding existing theoretical frameworks on aging, learning, and cognitive development. Consistent with the theories described in Chapter 1, the results support that

learning engagement in older adulthood can be cognitively stimulating, enhance functional capacities, and contribute to improved psychosocial well-being. However, this study extends these theories by highlighting how these outcomes occur in underserved populations, for whom prior educational experiences may have been limited. The interplay between cognitive, functional, and psychosocial factors, as well as the role of community-based support, may be a crucial mechanism for facilitating engagement in these populations, an element that is often missing in theoretical frameworks.

This study emphasizes the importance of social and community contexts in facilitating learning and aging outcomes. While existing theories tend to focus on individual-level cognitive processes, the findings suggest that community-based, social, and intergenerational support are key to promoting learning and psychosocial well-being. This gap in current theoretical models should be addressed by integrating the influence of environmental and social mechanisms to a higher and more explicit degree, particularly in the context of interventions targeting marginalized older adults.

Traditional perspectives on cognitive engagement emphasize continued cognitive activity, building from skills or experiences from earlier life (e.g., use-it-or-lose-it hypothesis, activity theory of aging; Havighurst & Albrecht, 1953; Havighurst, 1961; Hultsch et al., 1999). Yet, findings from this study suggest that for individuals with limited educational backgrounds and access to cognitively stimulating resources, engagement in learning may represent a novel cognitive experience, rather than a continuation of previously established patterns. For more privileged older adults, learning engagement in older adulthood might simply be a continuation or replacement of

previous cognitive stimulation derived from earlier life education or workplace trainings, but for underprivileged older adults who did not have those opportunities in earlier life, learning engagement might be the beginning of a novel type of cognitive stimulation. Therefore, theories on engagement among older adults should consider how to introduce novel cognitive stimulation via learning in ways that are accessible, motivating, and digestible, rather than assuming that prior cognitive engagement has primed them with a strong enough foundation for new exposure. Theories of learning engagement should incorporate strategies for initiating cognitive stimulation later in life, particularly among underserved populations.

This study also contributes new perspectives to the cognitive reserve theory (Stern, 2002). The existing theory focuses on reserve built through earlier life experiences, from education, occupation, and mentally stimulating activities, but this research raises critical questions about the potential for building cognitive reserve in later adulthood. The potential for cognitive reserve to be built in later life, even when previous life experiences may not have promoted extensive cognitive reserve, should be further explored. Incorporating these insights into cognitive reserve theory underscores the need to explicitly consider how interventions can support the accumulation of reserve in later life and among populations with historically fewer cognitively stimulating and educational opportunities.

Limitations

The present study has several strengths, including its focus on a marginalized population of older adults, its community-based implementation, and its use of a

mixed-methods design. However, there are limitations that must be considered. These limitations relate to the sample size, the distribution of demographic characteristics within the sample, aspects of the intervention design, and self-selection bias.

Acknowledging these limitations is necessary to inform future research directions.

As a primary limitation, the sample size of the study was relatively small, and participants were recruited from a single residential community, which limits the generalizability of the findings. Nonetheless, the study intentionally targeted a hard-to-reach population and yielded rich, in-depth data. Moreover, this study was designed as a pilot effort to assess the feasibility, acceptability, and preliminary impact of the intervention. In this context, smaller sample sizes are appropriate and consistent with methodological recommendations for pilot studies that prioritize feasibility rather than generalizability (Bell et al., 2018; Hertzog, 2008). Relatedly, the unequal distribution of participant characteristics in hand with the small sample size limited the ability to examine differences in outcomes based on certain demographic factors, such as gender and race/ethnicity. In terms of gender, the sample was predominantly female (29 females compared to 10 males), reflecting a common occurrence in intervention research and lifelong learning programs, where males are less likely to participate and are underrepresented (e.g., Hansen et al., 2019; Knox et al., 2023). Similarly, the sample was not evenly distributed by race/ethnicity, with the majority of participants identifying as Chinese, further limiting the ability to examine quantitative differences across cultural groups.

Another limitation of the present study is that it only included pre- to post-intervention assessments, with no follow-up measures. As a result, the study design does not allow for conclusions regarding the long-term impact of these effects or whether the observed changes were maintained over time. The study would have benefited from adopting a longitudinal research design to examine the enduring effects of participation in the learning intervention, as has been done in other studies (e.g., Leanos et al., 2023; Ferguson et al., 2023). Additionally, participants reported wanting a longer intervention, stating that they felt more time was needed to fully develop their skills. Increasing the duration of the program in future studies may not only better support skill development but also influence longer-term outcomes.

Furthermore, the intervention design included several components that have been previously associated with positive outcomes, such as social interaction, learning new skills, and motivational discussion sessions. The integration of all of these components within one intervention makes it difficult to isolate which aspects were responsible for the observed improvements. When looking at the quantitative findings alone, it is unclear whether the changes were driven by one particular component or a combination of them. Moreover, because participants engaged in different types of learning activities, it is not possible to determine whether certain skills or domains were more effective in producing change. The study did not employ an experimental design with multiple conditions or include a control group, as it was a within-subject feasibility trial primarily focused on assessing the implementation and acceptability of the intervention (Rebok, 2016). Future research incorporating a randomized controlled design with multiple conditions would

provide stronger evidence regarding the effectiveness of specific components and clarify the mechanisms underlying the observed outcomes.

Finally, because participation in the study was voluntary, it introduces the potential for self-selection bias (e.g., Haynes & Robinson, 2019; Kaźmierczak et al., 2023). Individuals who chose to participate in the intervention may have already been more motivated and open to engaging in learning activities than those who did not become interested in participating. As such, the applicability of the findings may not extend to older adults who are less inclined to pursue these opportunities. Also, the study does not fully capture the barriers faced by non-participants, including those with lower baseline motivation or additional structural and individual constraints (e.g., limited literacy) that restricted them from participating in the first place. Future research should explore strategies to engage older adults who are less likely to self-volunteer for these learning intervention opportunities.

Future Directions

The findings indicate that tailored, community-based learning interventions can be feasible and impactful among underserved older adult populations. Building on these findings and the limitations described, there are important future research directions to explore. Future learning intervention studies should include larger and more diverse samples of underserved older adults to examine the scalability and generalizability of this work. Efforts to recruit more balanced samples across gender and racial/ethnic groups are also needed to examine potential group differences. The present findings suggest that older adults with lower educational attainment may experience greater benefits from

learning new skills. As such, future research should further investigate the role of educational background and its influence on the potential benefit of learning engagement in older adulthood.

Future studies should also employ more rigorous experimental designs using longitudinal, randomized controlled trials with multiple conditions. Moreover, assessing how different forms of learning engagement impact outcomes is needed, including the type and number of skills taught, duration of the intervention, session frequency, and overall dosage (e.g., Ferguson et al., 2025; Gleib et al., 2026). Doing so would allow for a clearer understanding of the specific aspects that make learning engagement more impactful across outcomes. The findings also showed that learning experiences need to be carefully balanced in terms of challenge level to optimize engagement and cognitive stimulation. Future research should focus on identifying that balance between tasks that are sufficiently challenging yet not overwhelming for older adult learners. This balance is likely to vary across individuals, which would require the development of more personalized instructional approaches.

Strategies for individualizing learning in group-based learning environments need to be further explored for older adults in general. Approaches such as assessing prior knowledge, adapting instructional pacing, and incorporating tailored learning strategies that align with participants' abilities and preferences may encourage greater engagement and skill acquisition (Ahmad et al., 2022; Czaja & Sharit, 2016; Hailikari et al., 2008). Future studies should examine how different instructional approaches are received by older adult learners and how they influence learning outcomes. In the same vein, a less

explored yet important instructional strategy that should be integrated in future learning interventions for older adults is training them on “learning how to learn” (Sheffler et al., 2021). As highlighted in the findings, underserved older adults may require guidance on effective learning strategies, particularly after long periods without formal educational experiences. For more direct recommendations based on the evaluation of the intervention, please see Chapter 5 on lessons learned.

Based on the findings highlighting the importance of social and intergenerational support in facilitating learning engagement, future learning interventions should promote the inclusion of multidimensional support. Given the influence of family support reported in this study, interventions should aim to involve family members, caregivers, and close social networks in the learning process (e.g., Ashida et al., 2019). Future research should also investigate the role of intergenerational learning by comparing outcomes when older adults learn from older adult peers versus when they learn from younger individuals.

More funding needs to be allocated toward creating lifelong learning programs for older adults in marginalized communities to address inequities in access to education and resources that foster healthy aging outcomes. Lifelong learning is a matter that requires greater attention at the policy level (Formosa, 2023), as it bears many benefits that extend beyond the individual, impacting society as a whole (e.g., Gonzales et al., 2015; Talmage et al., 2018b; Wibawa et al., 2026). Supporting learning engagement in older adulthood can contribute to reduced healthcare costs and support a better economy (Aleandri & Refrigeri, 2013; Balatti & Falk, 2002; Levchenko et al., 2018) by promoting cognitive, functional, and psychological health through preventive health behaviors. Older adults

who remain cognitively and socially engaged are also more likely to contribute to their communities through volunteering, caregiving, and intergenerational knowledge-sharing, making them productive participants of society (e.g., Merriam & Kee, 2024; Morrow-Howell et al., 2005). Thus, investing in lifelong learning is not only a smart tactic for promoting positive aging outcomes but a societal strategy that supports healthier communities and social participation across the lifespan.

Conclusion

The study presented in this dissertation examined the impact and evaluated the implementation of a tailored, community-based learning intervention for Latino and Chinese older adults with a low income. Together, the quantitative and qualitative findings provide support that engaging in learning new skills can yield improvements across cognitive, functional independence, and psychosocial outcomes among underserved older adults. Furthermore, the results show that addressing structural barriers to learning participation (e.g., cost, transportation, language) results in accessible, feasible, and sustained engagement among participants. Aside from reducing structural barriers, the findings demonstrate that to facilitate sustained learning engagement, older adults benefit from receiving multidimensional support. However, themes on participants' perceived learning challenges indicate that there is room for improving the instructional design and environment of learning programs to better fit with older adult learners' needs. Overall, participants' described experiences in the intervention highlight that learning engagement is empowering, especially among those with lower educational attainment backgrounds. Future intervention studies should expand the scale of

implementation and include other underserved older adult populations to further examine the effects of learning engagement in later life. Such efforts would strengthen the generalizability of findings and contribute knowledge on how diverse older adult groups benefit from lifelong learning opportunities. Research and policy should prioritize the development of more equitable lifelong learning programs to help foster healthy aging and reduce disparities affecting marginalized older adults.

References

- Abraído-Lanza, A. F., Mendoza, S., & Armbrister, A. N. (2018). Latino health. In T. A. Revenson, & R. A. R. Gurung (Eds.), *Handbook of health psychology* (1st ed., pp. 342-354). Routledge. <https://doi.org/10.4324/9781315167534>
- Ackerman, P. L. (1996). A theory of adult intellectual development: Process, personality, interests, and knowledge. *Intelligence*, 22(2), 227-257. [https://doi.org/10.1016/S0160-2896\(96\)90016-1](https://doi.org/10.1016/S0160-2896(96)90016-1)
- Administration for Community Living. (2024). *2023 profile of older Americans*. https://acl.gov/sites/default/files/Profile%20of%20OA/ACL_ProfileOlderAmericans2023_508.pdf
- Ahmad, N. A., Abd Rauf, M. F., Mohd Zaid, N. N., Zainal, A., Tengku Shahdan, T. S., & Abdul Razak, F. H. (2022). Effectiveness of instructional strategies designed for older adults in learning digital technologies: A systematic literature review. *SN Computer Science*, 3, 130. <https://doi.org/10.1007/s42979-022-01016-0>
- Aleandri, G., & Refrigeri, L. (2013). Lifelong learning, training and education in globalized economic systems: Analysis and perspectives. *Procedia-Social and Behavioral Sciences*, 93, 1242-1248. <https://doi.org/10.1016/j.sbspro.2013.10.022>
- Al Hazzouri, A. Z., Elbejjani, M., Abi Chahine, M., Sadana, R., & Sibai, A. M. (2021). Late-life learning and health: Challenges, opportunities, and future directions. *The Lancet Healthy Longevity*, 2(10), e613-e614. [https://doi.org/10.1016/S2666-7568\(21\)00207-5](https://doi.org/10.1016/S2666-7568(21)00207-5)
- Alexandropoulos, P. (2024). Evaluating the benefits and barriers of Lifelong Learning for older adults. *International Scientific Educational Journal*, 12(2), 104-116.
- Aljondi, R., Szoeki, C., Steward, C., Yates, P., & Desmond, P. (2019). A decade of changes in brain volume and cognition. *Brain Imaging and Behavior*, 13, 554-563. <https://doi.org/10.1007/s11682-018-9887-z>
- Alonso Ruiz, R. A., Sanz Arazuri, E., Sáenz de Jubera Ocón, M., Valdemoros San Emeterio, M. Á., & Ponce de León Elizondo, A. (2024). Do grandparents contribute to their grandchildren's learning through shared leisure activities? *Education Sciences*, 14(1), Article 84. <https://doi.org/10.3390/educsci14010084>
- Alzheimer Society. (2025). *The differences between normal aging and dementia*. <https://alzheimer.ca/en/about-dementia/do-i-have-dementia/differences-between-normal-aging-dementia>
- Alzheimer's Association. (2010). 2010 Alzheimer's disease facts and figures. *Alzheimer's & dementia: The Journal of the Alzheimer's Association*, 6(2), 158–194. <https://doi.org/10.1016/j.jalz.2010.01.009>

- Alzheimer's Association. (2020). *Race Ethnicity, and Alzheimer's* [Fact Sheet].
https://aaic.alz.org/downloads2020/2020_Race_and_Ethnicity_Fact_Sheet.pdf
- Alzheimer's Association. (2021). 2021 Alzheimer's disease facts and figures. *Alzheimer's & dementia: The Journal of the Alzheimer's Association*, 17(3), 327–406.
<https://doi.org/10.1002/alz.12328>
- Alzubi, A. A., Nazim, M., & Ahamad, J. (2024). Examining the effect of a collaborative learning intervention on EFL students' English learning and social interaction. *Journal of Pedagogical Research*, 8(2), 26-46.
<https://doi.org/10.33902/JPR.202425541>
- Andrés, P., Parmentier, F. B., & Escera, C. (2006). The effect of age on involuntary capture of attention by irrelevant sounds: A test of the frontal hypothesis of aging. *Neuropsychologia*, 44(12), 2564-2568.
<https://doi.org/10.1016/j.neuropsychologia.2006.05.005>
- Anstey, K. J., & Low, L. F. (2004). Normal cognitive changes in aging. *Australian Family Physician*, 33(10), 783-787.
<https://search.informit.org/doi/10.3316/informit.371473582807630>
- Appelhans, B. M. (2023). The cognitive burden of poverty: A mechanism of socioeconomic health disparities. *American Journal of Preventive Medicine*, 64(2), 293-297. <https://doi.org/10.1016/j.amepre.2022.08.012>
- Ashida, S., Sewell, D. K., Schafer, E. J., Schroer, A., & Friberg, J. (2019). Social network members who engage in activities with older adults: Do they bring more social benefits than other members? *Ageing & Society*, 39(5), 1050-1069.
<https://doi.org/10.1017/S0144686X17001490>
- Bailey, H., Dunlosky, J., & Hertzog, C. (2010). Metacognitive training at home: Does it improve older adults' learning? *Gerontology*, 56(4), 414-420.
<https://doi.org/10.1159/000266030>
- Bailey, Z. D., Krieger, N., Agénor, M., Graves, J., Linos, N., & Bassett, M. T. (2017). Structural racism and health inequities in the USA: evidence and interventions. *The Lancet*, 389(10077), 1453-1463.
[https://doi.org/10.1016/S0140-6736\(17\)30569-X](https://doi.org/10.1016/S0140-6736(17)30569-X)
- Balatti, J., & Falk, I. (2002). Socioeconomic contributions of adult learning to community: A social capital perspective. *Adult Education Quarterly*, 52(4), 281-298. <https://doi.org/10.1177/074171302400448618>
- Balog, N. (2018). *Older adults and successful aging: The effects of lifelong learning*. Youngstown State University.

- Baltes, P. B., & Baltes, M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. In P. B. Baltes & M. M. Baltes (Eds.), *Successful aging: Perspectives from the behavioral sciences* (pp. 1–34). Cambridge University Press.
<https://doi.org/10.1017/CBO9780511665684.003>
- Bandura, A. (1997). *Self-efficacy: The exercise of control* (Vol. 11). Freeman.
- Bartels, C., Wegrzyn, M., Wiedl, A., Ackermann, V., & Ehrenreich, H. (2010). Practice effects in healthy adults: a longitudinal study on frequent repetitive cognitive testing. *BMC Neuroscience*, 11(1), 118. <https://doi.org/10.1186/1471-2202-11-118>
- Bedford, O., & Yeh, K. H. (2019). The history and the future of the psychology of filial piety: Chinese norms to contextualized personality construct. *Frontiers in Psychology*, 10, 100. <https://doi.org/10.3389/fpsyg.2019.00100>
- Bekteshi, V., Sifat, M., & Kendzor, D. E. (2024). Reaching the unheard: Overcoming challenges in health research with hard-to-reach populations. *International Journal for Equity in Health*, 23(1), Article 61.
<https://doi.org/10.1186/s12939-024-02145-z>
- Bell, M. L., Whitehead, A. L., & Julious, S. A. (2018). Guidance for using pilot studies to inform the design of intervention trials with continuous outcomes. *Clinical Epidemiology*, 10, 153-157. <https://doi.org/10.2147/CLEP.S146397>
- Beswick, A. D., Rees, K., Dieppe, P., Ayis, S., Gooberman-Hill, R., Horwood, J., & Ebrahim, S. (2008). Complex interventions to improve physical function and maintain independent living in elderly people: A systematic review and meta-analysis. *The Lancet*, 371(9614), 725–735.
- Bhana, A., & Govender, A. (2010). Evaluating interventions. In I. Petersen, A. Bhana, A. J. Flisher, L. Swartz, & L. Richter (Eds.), *Promoting mental health in scarce-resource contexts: Emerging evidence and practice* (pp. 60–81). HSRC Press
- Bhutta, N., Chang, A. C., Dettling, L. J., & Hsu, J. W. (2020). *FEDS Notes: Disparities in wealth by race and ethnicity in the 2019 survey of consumer finances*. Board of Governors of the Federal Reserve System.
<https://doi.org/10.17016/2380-7172.2797>
- Blazer, D. G., Yaffe, K., Liverman, C. T., & Committee on the Public Health Dimensions of Cognitive Aging. (2015). Characterizing and assessing cognitive aging. In D. G. Blazer, K. Yaffe, & C. T. Liverman (Eds.), *Cognitive aging: Progress in understanding and opportunities for action* (pp. 31-74). National Academies Press.

- Bonevski, B., Randell, M., Paul, C., Chapman, K., Twyman, L., Bryant, J., Brozek, I., & Hughes, C. (2014). Reaching the hard-to-reach: A systematic review of strategies for improving health and medical research with socially disadvantaged groups. *BMC Medical Research methodology*, 14, Article 42. <https://doi.org/10.1186/1471-2288-14-42>
- Borkowski, J. G., Benton, A. L., & Spreen, O. (1967). Word fluency and brain damage. *Neuropsychologia*, 5(2), 135–140. [https://doi.org/10.1016/0028-3932\(67\)90015-2](https://doi.org/10.1016/0028-3932(67)90015-2)
- Borman, G. D., & Overman, L. T. (2004). Academic resilience in mathematics among poor and minority students. *The Elementary School Journal*, 104(3), 177-195. <https://doi.org/10.1086/499748>
- Boudioni, M., McLaren, S. M., Woods, L. P., & Lemma, F. (2007). Lifelong learning, its facilitators and barriers in primary care settings: a qualitative study. *Primary Health Care Research & Development*, 8(2), 157-169. <https://doi.org/10.1017/S1463423607000187>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77-101. <https://doi.org/10.1191/1478088706qp063oa>
- Breda, A. I., & Watts, A. S. (2017). Expectations regarding aging, physical activity, and physical function in older adults. *Gerontology and Geriatric Medicine*, 3. <https://doi.org/10.1177/2333721417702350>
- Brickman, P., & Campbell, D. T. (1971). Hedonic relativism and planning the good society. In M. H. Appley (Ed.), *Adaptation-level theory* (pp. 287-301). Academic Press.
- Brink, S. (2017). Learning in later years in the lifelong learning trajectory. *Journal of Inter generational Relationships*, 15(1), 14-25. <https://doi.org/10.1080/15350770.2017.1260391>
- Brodaty, H., Pond, D., Kemp, N. M., Luscombe, G., Harding, L., Berman, K., & Huppert, F. A. (2002). The GPCOG: A new screening test for dementia designed for general practice. *Journal of the American Geriatrics Society*, 50(3), 530-534. <https://doi.org/10.1046/j.1532-5415.2002.50122.x>
- Brogno, B. (2025). Aging with strength: Functional training to support independence and quality of life. *INQUIRY: The Journal of Health Care Organization, Provision, and Financing*, 62. <https://doi.org/10.1177/00469580251348133>
- Bronfenbrenner, U. (2000). Ecological systems theory. In A. E. Kazdin (Ed.), *Encyclopedia of Psychology* (Vol. 3, pp. 129–133). Oxford University Press.

- Brown, V. A. (2021). An introduction to linear mixed-effects modeling in R. *Advances in Methods and Practices in Psychological Science*, 4(1).
<https://doi.org/10.1177/2515245920960351>.
- Bugos, J. A., & Wang, Y. (2022). Piano training enhances executive functions and psychosocial outcomes in aging: Results of a randomized controlled trial. *The Journals of Gerontology: Series B*, 77(9), 1625–1636.
<https://doi.org/10.1093/geronb/gbac021>
- Bugos, J. A., Perlstein, W. M., McCrae, C. S., Brophy, T. S., & Bedenbaugh, P. H. (2007). Individualized piano instruction enhances executive functioning and working memory in older adults. *Aging & Mental Health*, 11(4), 464-471.
<https://doi.org/10.1080/13607860601086504>
- Burnes, D., Sheppard, C., Henderson Jr, C. R., Wassel, M., Cope, R., Barber, C., & Pillemer, K. (2019). Interventions to reduce ageism against older adults: A systematic review and meta-analysis. *American Journal of Public Health*, 109(8), e1-e9. <https://doi.org/10.2105/AJPH.2019.305123>
- Butler, J., & Kern, M. L. (2016). The PERMA-Profilier: A brief multidimensional measure of flourishing. *International Journal of Wellbeing*, 6(3), 1-48.
<https://doi.org/10.5502/ijw.v6i3.1>
- Caamaño-Isorna, F., Corral, M., Montes-Martínez, A., & Takkouche, B. (2006). Education and dementia: A meta-analytic study. *Neuroepidemiology*, 26(4), 226–232. <https://doi.org/10.1159/000093378>
- Cachioni, M., Nascimento Ordonez, T., da Silva, T. B. L., Tavares Batistoni, S. S., Sanches Yassuda, M., Caldeira Melo, R., Rodrigues da Costa Domingues, M. A., & Lopes, A. (2014). Motivational factors and predictors for attending a continuing education program for older adults. *Educational Gerontology*, 40(8), 584-596. <https://doi.org/10.1080/03601277.2013.802188>
- Cadar, D., Pikhart, H., Mishra, G., Stephen, A., Kuh, D., & Richards, M. (2012). The role of lifestyle behaviors on 20-year cognitive decline. *Journal of Aging Research*, 2012(1), Article 304014. <https://doi.org/10.1155/2012/304014>
- Calderón, J. L., Baker, R. S., Fabrega, H., Conde, J. G., Hays, R. D., Fleming, E., & Norris, K. (2006). An ethno-medical perspective on research participation: A qualitative pilot study. *Medscape General Medicine*, 8(2), Article 23.
<https://pubmed.ncbi.nlm.nih.gov/16926762/>
- Carr, E. G., Dunlap, G., Horner, R. H., Koegel, R. L., Turnbull, A. P., Sailor, W., Anderson, J. L., Albin, R. W., Koegel, L. K., & Fox, L. (2002). Positive behavior support: Evolution of an applied science. *Journal of Positive Behavior Interventions*, 4(1), 4-16. <https://doi.org/10.1177/109830070200400102>

- Castillo, E. G., Ijadi-Maghsoodi, R., Shadravan, S., Moore, E., Mensah III, M. O., Docherty, M., Aguilera Nunez, M. G., Barcelo, N., Goodsmith, N., Halpin, L. E., Morton, I., Mango, J., Montero, A. E., Koushkaki, S. R., Bromely, E., Chung, B., Jones, F., Gabrielian, S., Gelberg, L., ... & Wells, K. B. (2019). Community interventions to promote mental health and social equity. *Current Psychiatry Reports*, 21(5), Article 35. <https://doi.org/10.1007/s11920-019-1017-0>
- Castro Rojas, M. D. (2021). Barriers and supportive factors for older adults learning about and using information and communication technologies for healthy aging in Costa Rica. *Educational Gerontology*, 47(10), 433-446. <https://doi.org/10.1080/03601277.2021.1989228>
- Chan, M. Y., Haber, S., Drew, L. M., & Park, D. C. (2016). Training older adults to use tablet computers: Does it enhance cognitive function? *The Gerontologist*, 56(3), 475-484. <https://doi.org/10.1093/geront/gnu057>
- Chang, D. F., & Lin, S. P. (2011). Motivation to learn among older adults in Taiwan. *Educational Gerontology*, 37(7), 574-592. <https://doi.org/10.1080/03601271003715962>
- Chen, Y., Lv, C., Li, X., Zhang, J., Chen, K., Liu, Z., Li, H., Fan, J., Qin, T., Luo, L., & Zhang, Z. (2019). The positive impacts of early-life education on cognition, leisure activity, and brain structure in healthy aging. *Aging*, 11(14), 4923-4942. <https://doi.org/10.18632/aging.102088>
- Chin, S. Y., Chua, J., Widjaja, N., Ang, S., & Malhotra, R. (2024). Inequalities in older adults' lifelong learning: how socio-economic status shapes participation and benefits. *Innovation in Aging*, 8(Supplement_1), 31. <https://doi.org/10.1093/geroni/igae098.0093>
- Chin, S. Y., Chua, J. Y. X., Widjaja, N., Malhotra, R., & Ang, S. (2026). Socio-Economic Status Inequalities in Older Adults' Learning Participation and Benefits. *Journal of Applied Gerontology*. <https://doi.org/10.1177/07334648261415579>
- Choi, I., & Cho, S. R. (2021). A case study of active aging through lifelong learning: Psychosocial interpretation of older adult participation in evening schools in Korea. *International Journal of Environmental Research and Public Health*, 18(17), Article 9232. <https://doi.org/10.3390/ijerph18179232>
- Choi, N. G., & DiNitto, D. M. (2014). Felt age and cognitive-affective depressive symptoms in late life. *Aging & Mental Health*, 18(7), 833-837. <https://doi.org/10.1080/13607863.2014.886669>
- Cialdini, R. B. (1993). *Influence: The psychology of persuasion*. William Morrow.

- Cohen, J. (1960). A coefficient of agreement for nominal scales. *Educational and Psychological Measurement*, 20(1), 37-46.
<https://doi.org/10.1177/001316446002000104>
- Collins, S. E., Clifasefi, S. L., Stanton, J., The LEAP Advisory Board, Straits, K. J. E., Gil-Kashiwabara, E., Rodriguez Espinosa, P., Nicasio, A. V., Andrasik, M. P., Hawes, S. M., Miller, K. A., Nelson, L. A., Orfaly, V. E., Duran, B. M., & Wallerstein, N. (2018). Community-based participatory research (CBPR): Towards equitable involvement of community in psychology research. *American Psychologist*, 73(7), 884–898. <https://doi.org/10.1037/amp0000167>
- Conesa, J., Garcia-Alsina, M., Batalla-Busquets, J. M., Gómez-Zúñiga, B., Martínez-Argüelles, M. J., Monjo, T., Mor, E., & Gil, M. D. C. C. (2023). A vision about lifelong learning and its barriers. *International Journal of Grid and Utility Computing*, 14(1), 62-71. <https://doi.org/10.1504/IJGUC.2023.129706>
- Cornford, I. R. (2002). Learning-to-learn strategies as a basis for effective lifelong learning. *International Journal of Lifelong Education*, 21(4), 357-368.
<https://doi.org/10.1080/02601370210141020>
- Courtney, M. D., Edwards, H. E., Chang, A. M., Parker, A. W., Finlayson, K., Bradbury, C., & Nielsen, Z. (2012). Improved functional ability and independence in activities of daily living for older adults at high risk of hospital readmission: A randomized controlled trial. *Journal of Evaluation in Clinical Practice*, 18(1), 128–134. <https://doi.org/10.1111/j.1365-2753.2010.01547.x>
- Creswell, J. W., & Clark, V. L. P. (2007). *Designing and conducting mixed methods research*. Sage Publications.
- Creswell, J. W., & Clark, V. L. P. (2017). *Designing and conducting mixed methods research*. Sage Publications.
- Cross, R., Greaves, C., Withall, J., Kritz, M., & Stathi, A. (2023). A qualitative longitudinal study of motivation in the RETirement in ACTion (REACT) physical activity intervention for older adults with mobility limitations. *International Journal of Behavioral Nutrition and Physical Activity*, 20(1), 50.
<https://doi.org/10.1186/s12966-023-01434-0>
- Curry, L. A., Nembhard, I. M., & Bradley, E. H. (2009). Qualitative and mixed methods provide unique contributions to outcomes research. *Circulation*, 119(10), 1442-1452. <https://doi.org/10.1161/CIRCULATIONAHA.107.742775>
- Czaja, S. J., & Sharit, J. (2016). *Designing training and instructional programs for older adults*. CRC Press. <https://doi.org/10.1201/b13018>

- De Jong, T. (2010). Cognitive load theory, educational research, and instructional design: Some food for thought. *Instructional Science*, 38(2), 105-134.
<https://doi.org/10.1007/s11251-009-9110-0>
- Dench, S., & Regan, J. (2000). *Learning in later life: Motivation and impact*. Department for Education and Employment.
<https://www.employment-studies.co.uk/resource/learning-later-life-motivation-and-impact>
- Denford, S., Abraham, C., Callaghan, M., Aighton, P., De Vocht, F., & Arris, S. (2017). A review of Grey and academic literature of evaluation guidance relevant to public health interventions. *BMC Health Services Research*, 17(1), 643.
<https://doi.org/10.1186/s12913-017-2588-2>
- Depp, C., Vahia, I. V., & Jeste, D. (2010). Successful aging: Focus on cognitive and emotional health. *Annual Review of Clinical Psychology*, 6, 527–550.
<https://doi.org/10.1146/annurev.clinpsy.121208.131449>
- Díaz-Venegas, C., Downer, B., Langa, K. M., & Wong, R. (2016). Racial and ethnic differences in cognitive function among older adults in the USA. *International Journal of Geriatric Psychiatry*, 31(9), 1004–1012.
<https://doi.org/10.1002/gps.4410>
- Díaz-Venegas, C., Downer, B., Langa, K. M., & Wong, R. (2019). Cognitive functioning of US adults by race and Hispanic origin. In A. W. Vega, R. L. Gutierrez, & K. Markides (Eds.), *Contextualizing Health and Aging in the Americas* (pp. 85–107). Springer. https://doi.org/10.1007/978-3-030-00584-9_5
- Dong, Q., Liu, T., Liu, R., Yang, H., & Liu, C. (2023). Effectiveness of digital health literacy interventions in older adults: Single-arm meta-analysis. *Journal of Medical Internet Research*, 25, e48166. <https://doi.org/10.2196/48166>
- Duffin, E. (2021). *Percentage of educational attainment in the United States in 2018, by ethnicity*. U.S. Census Bureau.
<https://www.statista.com/statistics/184264/educationalattainment-by-ethnicity/>
- Dunlosky, J., & Hertzog, C. (1998). Training programs to improve learning in later adulthood: Helping older adults educate themselves. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Metacognition in educational theory and practice* (pp. 249-275). Routledge.
- Dunlosky, J., & Metcalfe, J. (2009). *Metacognition*. Sage Publications.
- Ermer, A. E., & Proulx, C. M. (2019). Associations between social connectedness, emotional well-being, and self-rated health among older adults: Difference by relationship status. *Research on Aging*, 41(4), 336-361.
<https://doi.org/10.1177/0164027518815260>

- Escuder-Mollon, P., Esteller-Curto, R., Ochoa, L., & Bardus, M. (2014). Impact on senior learners' quality of life through lifelong learning. *Procedia-Social and Behavioral Sciences*, 131, 510-516. <https://doi.org/10.1016/j.sbspro.2014.04.157>
- Fang, Z., & Sim, N. (2024). Does lifelong learning matter for the subjective wellbeing of the elderly? A machine learning analysis on Singapore data. *Plos One*, 19(6), Article e0303478. <https://doi.org/10.1371/journal.pone.0303478>
- Farokhian, F., Yang, C., Beheshti, I., Matsuda, H., & Wu, S. (2017). Age-related gray and white matter changes in normal adult brains. *Aging and Disease*, 8(6), 899-909. <https://doi.org/10.14336/AD.2017.0502>
- Feagin, J. R., & Cobas, J. A. (2015). *Latinos facing racism: Discrimination, resistance, and endurance* (1st ed.). Routledge. <https://doi.org/10.4324/9781315633749>
- Feinstein, L., & Hammond, C. (2004). The contribution of adult learning to health and social capital. *Oxford Review of Education*, 30(2), 199-221. <https://doi.org/10.1080/0305498042000215520>
- Ferguson, L., Mehrkesh, A., Kürüm, E., Rebok, G. W., & Wu, R. (2025). Skill-learning variety and frequency on long-term cognitive performance in older adults. *Educational Gerontology*, 1-14. <https://doi.org/10.1080/03601277.2025.2515562>
- Ferguson, L., Sain, D., Kürüm, E., Strickland-Hughes, C. M., Rebok, G. W., & Wu, R. (2023). One-year cognitive outcomes from a multiple real-world skill learning intervention with older adults. *Aging & Mental Health*, 27(11), 2134-2143. <https://doi.org/10.1080/13607863.2023.2197847>
- Field, J. (2009). Good for your soul? Adult learning and mental well-being. *International Journal of Lifelong Education*, 28(2), 175-191. <https://doi.org/10.1080/02601370902757034>
- Field, J. (2011). Is lifelong learning making a difference? Research-based evidence on the impact of adult learning. In D. Aspin, J. Chapman, K. Evans, & R. Bagnall (Eds.), *Second international handbook of lifelong learning* (pp. 887-897). Springer Dordrecht. https://doi.org/10.1007/978-94-007-2360-3_54
- Figueiredo, B., Luu, N., Buschgens, M., Aleti, T., Sheahan, J., Martin, D. M., Hjorth, L., Reid, M., Wall, G., & Grigg, A. (2025). Towards a strengths-based PEER framework: how peer learning behaviours help develop ICT competencies in older adults. *Behaviour & Information Technology*, 45(4), 629-645. <https://doi.org/10.1080/0144929X.2025.2525304>
- Findsen, B., & Formosa, M. (2011). *Lifelong learning in later life: A handbook on older adult learning* (Vol. 7). Springer Science & Business Media. <https://doi.org/10.1007/978-94-6091-651-9>

- Flauzino, K. D. L., Pimentel, M. D. G. C., Batistoni, S. S. T., Zaine, I., Vieira, L. O. B., Rodrigues, K. R. D. H., & Cachioni, M. (2020). Digital Literacy for Older Adults: Perceptions about teaching-learning. *Educação e Realidade*, 45(4). <https://doi.org/10.1590/2175-6236104913>
- Fletcher, J., Topping, M., Zheng, F., & Lu, Q. (2021). The effects of education on cognition in older age: Evidence from genotyped siblings. *Social Science & Medicine*, 280, 114044. <https://doi.org/10.1016/j.socscimed.2021.114044>
- Formosa, M. (2019). *The university of the third age and active ageing: European and Asian-Pacific Perspectives*. Springer. <https://doi.org/10.1007/978-3-030-21515-6>
- Formosa, M. (2023). Five decades of older adult learning: Achievements and challenges. *International Journal of Education and Ageing*, 5(3), 91-104.
- Forrester, S. N., Gallo, J. J., Whitfeld, K. E., & Thorpe, R. J., Jr. (2019). A framework of minority stress: From physiological manifestations to cognitive outcomes. *The Gerontologist*, 59(6), 1017–1023. <https://doi.org/10.1093/geront/gny104>
- Forrin, N. D., Huynh, A. C., Smith, A. C., Cyr, E. N., McLean, D. B., Siklos-Whillans, J., Risko, E. F., Smilek, D., & MacLeod, C. M. (2021). Attention spreads between students in a learning environment. *Journal of Experimental Psychology: Applied*, 27(2), 276–291. <https://doi.org/10.1037/xap0000341>
- Franklin, S. V., Hane, E., Kustusch, M. B., Ptak, C., & Sayre, E. C. (2018). Improving retention through metacognition. *Journal of College Science Teaching*, 48(2), 21-27. <https://www.jstor.org/stable/26616264>
- Friedman, N. P., & Robbins, T. W. (2022). The role of prefrontal cortex in cognitive control and executive function. *Neuropsychopharmacology*, 47(1), 72-89. <https://doi.org/10.1038/s41386-021-01132-0>
- Frisby, B. N., Sexton, B. T., Buckner, M. M., Beck, A. C., & Kaufmann, R. (2018). Peers and instructors as sources of distraction from a cognitive load perspective. *International Journal for the Scholarship of Teaching and Learning*, 12, 1–10. <https://doi.org/10.20429/ijstol.2018.120206>
- Fung, K. C., & Mow, W. H. (2025). TrainBo: An interactive robot-assisted scenario training system for older adults with dementia. *ACM Human-Computer Interaction*. <https://doi.org/10.48550/arXiv.2025.12080>
- Ganguli, M., Beer, J. C., Zmuda, J. M., Ryan, C. M., Sullivan, K. J., Chang, C. C. H., & Rao, R. H. (2020). Aging, diabetes, obesity, and cognitive decline: A population-based study. *Journal of the American Geriatrics Society*, 68(5), 991-998. <https://doi.org/10.1111/jgs.16321>

- Garcia, M. A., Saenz, J., Downer, B., & Wong, R. (2018). The role of education in the association between race/ethnicity/nativity, cognitive impairment, and dementia among older adults in the United States. *Demographic Research*, 38, 155–168. <https://doi.org/10.4054/DemRes.2018.38.6>
- George, S., Duran, N., & Norris, K. (2014). A systematic review of barriers and facilitators to minority research participation among African Americans, Latinos, Asian Americans, and Pacific islanders. *American Journal of Public Health*, 104(2), e16–e31. <https://doi.org/10.2105/AJPH.2013.301706>
- Gitlin, L. N., & Czaja, S. J. (2015). *Behavioral intervention research: Designing, evaluating, and implementing*. Springer publishing company.
- Glei, D. A., Lee, C., Brown, C. K., & Weinstein, M. (2026). Does Type or Diversity of Activities Delay Aging-Related Cognitive Decline? *Innovation in Aging*, 10(2), Article igaf133. <https://doi.org/10.1093/geroni/igaf133>
- Glendenning, F. (2004). Education for older adults: Lifelong learning, empowerment, and social change. In J. F. Nussbaum & J. Coupland (Eds.), *Handbook of communication and aging research* (2nd ed., pp. 523-541). Routledge. <https://doi.org/10.4324/9781410610171>
- Glisky, E. L. (2007). Changes in cognitive function in human aging. In D. R. Riddle (Ed.), *Brain aging* (1st ed., pp. 3-20). CRC Press. <https://doi.org/10.1201/9781420005523>
- Goldman, Z. W., Goodboy, A. K., & Weber, K. (2017). College students' psychological needs and intrinsic motivation to learn: An examination of self-determination theory. *Communication Quarterly*, 65(2), 167-191. <https://doi.org/10.1080/01463373.2016.1215338>
- Gómez-Soria, I., Iguacel, I., Aguilar-Latorre, A., Peralta-Marrupe, P., Latorre, E., Zaldívar, J. N. C., & Calatayud, E. (2023). Cognitive stimulation and cognitive results in older adults: A systematic review and meta-analysis. *Archives of Gerontology and Geriatrics*, 104, Article 104807. <https://doi.org/10.1016/j.archger.2022.104807>
- Gonzales, E., Matz-Costa, C., & Morrow-Howell, N. (2015). Increasing opportunities for the productive engagement of older adults: A response to population aging. *The Gerontologist*, 55(2), 252-261. <https://doi.org/10.1093/geront/gnu176>
- Gradín, C. (2012). Poverty among minorities in the United States: Explaining the racial poverty gap for Blacks and Latinos. *Applied Economics*, 44(29), 3793-3804. <https://doi.org/10.1080/00036846.2011.581219> 3.

- Graham, J. W. (2009). Missing data analysis: Making it work in the real world. *Annual Review of Psychology*, 60, 549-576.
<https://doi.org/10.1146/annurev.psych.58.110405.085530>
- Greene, J. A., Cartiff, B. M., & Duke, R. F. (2018). A meta-analytic review of the relationship between epistemic cognition and academic achievement. *Journal of Educational Psychology*, 110(8), 1084–1111. <https://doi.org/10.1037/edu0000263>
- Greenfeld, E. A., & Moorman, S. M. (2019). Childhood socioeconomic status and later life cognition: Evidence from the Wisconsin longitudinal study. *Journal of Aging and Health*, 31(9), 1589–1615. <https://doi.org/10.1177/0898264318783489>
- Gregg, E. W., Yaffe, K., Cauley, J. A., Rolka, D. B., Blackwell, T. L., Narayan, K. V., & Cummings, S. R. (2000). Is diabetes associated with cognitive impairment and cognitive decline among older women? *Archives of Internal Medicine*, 160(2), 174–180. <https://doi.org/10.1001/archinte.160.2.174>
- Grosso, T. (2018). Lifelong learning: The key to successful aging. *Journal of Educational Leadership in Action*, 5(2), Article 10. <https://doi.org/10.62608/2164-1102.1046>
- Gualano, M. R., Voglino, G., Bert, F., Thomas, R., Camussi, E., & Siliquini, R. (2018). The impact of intergenerational programs on children and older adults: A review. *International Psychogeriatrics*, 30(4), 451-468.
<https://doi.org/10.1017/S104161021700182X>
- Guetterman, T. C., Fетters, M. D., & Creswell, J. W. (2015). Integrating quantitative and qualitative results in health science mixed methods research through joint displays. *The Annals of Family Medicine*, 13(6), 554-561. <https://doi.org/10.1370/afm.1865>
- Günen, M. S., & Vural, Ö. F. (2023). Lifelong learning barriers: A theoretical research. *Journal of Multidisciplinary Studies in Education*, 7(4), 164-180.
- Habibi, A., Kreutz, G., Russo, F., & Tervaniemi, M. (2022). Music-based interventions in community settings: Navigating the tension between rigor and ecological validity. *Annals of the New York Academy of Sciences*, 1518(1), 47-57.
<https://doi.org/10.1111/nyas.14908>
- Hachem, H. (2023). Ask them why: Older learners' motivational reasons for learning at a university for the third age. *Studies in the Education of Adults*, 55(1), 82-100.
<https://doi.org/10.1080/02660830.2022.2040347>
- Hachem, H., Nikkola, E., & Zaidan, A. (2017). The case of educational gerontology in Lebanon: a harbinger of empowerment, emancipation and social change? *International Journal of Lifelong Education*, 36(6), 713-729.
<https://doi.org/10.1080/02601370.2017.1379565>

- Hacker, D. J., Dunlosky, J., & Graesser, A. C. (Eds.). (2009). *Handbook of metacognition in education*. Routledge. <https://doi.org/10.4324/9780203876428>
- Hailikari, T., Katajavuori, N., & Lindblom-Ylänne, S. (2008). The relevance of prior knowledge in learning and instructional design. *American Journal of Pharmaceutical Education*, 72(5), 113. <https://doi.org/10.5688/aj7205113>
- Hales, C. M., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2017). *Prevalence of obesity among adults and youth: United States, 2015–2016*. Centers for Disease Control and Prevention. <https://www.cdc.gov/nchs/data/databriefs/db288.pdf>
- Hansen, R. J., Talmage, C. A., Thaxton, S. P., & Knopf, R. C. (2019). Barriers to age-friendly universities (AFU): Lessons from Osher Lifelong Learning Institute demographics and perceptions. *Gerontology & Geriatrics Education*, 40(2), 221–243. <https://doi.org/10.1080/02701960.2019.1572003>
- Hammond, C., & Feinstein, L. (2005). The effects of adult learning on self-efficacy. *London Review of Education*, 3(3), 265–287. <https://doi.org/10.1080/14748460500372754>
- Hanson, M. (2025). *Education attainment statistics*. Education data initiative. <https://educationdata.org/education-attainment-statistics>
- Harada, C. N., Love, M. C. N., & Triebel, K. (2013). Normal cognitive aging. *Clinics in Geriatric Medicine*, 29(4), 737–752. <https://doi.org/10.1016/j.cger.2013.07.002>
- Harb, C. A., & Taylor, M. J. (2024). The utility of community-based participatory research: Increasing research engagement among minoritized ethnoracial groups. *Psychiatric Rehabilitation Journal*, 47(1), 22–29. <https://doi.org/10.1037/prj0000558>
- Harding, S. C., Thang, L. L., & Subramaniam, A. (2024). Lifelong learning and healthy ageing: A global and Singaporean perspective. In J. Byles (Ed.), *What Matters for Healthy Ageing* (pp. 69–91). Springer Nature Singapore. https://doi.org/10.1007/978-981-96-0462-3_5
- Harris, N., & Bacon, C. E. W. (2019). Developing cognitive skills through active learning: A systematic review of health care professions. *Athletic Training Education Journal*, 14(2), 135–148. <https://doi.org/10.4085/1402135>
- Havighurst, R. J., & Albrecht, R. (1953). *Older people*. Longmans, Green.
- Havighurst, R. J. (1961). Successful aging. *The Gerontologist*, 1, 8–13. <https://doi.org/10.1093/geront/1.1.8>

- Haynes, A., & Robinson, E. (2019). Who are we testing? Self-selection bias in laboratory-based eating behaviour studies. *Appetite*, 141, Article 104330. <https://doi.org/10.1016/j.appet.2019.104330>
- Healey, M. K., Campbell, K. L., & Hasher, L. (2008). Cognitive aging and increased distractibility: Costs and potential benefits. *Progress in Brain Research*, 169, 353-363. [https://doi.org/10.1016/S0079-6123\(07\)00022-2](https://doi.org/10.1016/S0079-6123(07)00022-2)
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, 33(2-3), 61-83. <https://doi.org/10.1017/S0140525X0999152X>
- Hertzog, C., Kramer, A. F., Wilson, R. S., & Lindenberger, U. (2008). Enrichment effects on adult cognitive development: Can the functional capacity of older adults be preserved and enhanced? *Psychological Science in the Public Interest*, 9(1), 1-65. <https://doi.org/10.1111/j.1539-6053.2009.01034.x>
- Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. *Research in Nursing & Health*, 31(2), 180-191. <https://doi.org/10.1002/nur.20247>
- Ho, D. Y. F. (1996). Filial piety and its psychological consequences. In M. H. Bond (Ed.), *The handbook of Chinese psychology* (pp. 155-165). Oxford University Press.
- Hoque, M. E. (2016). Three domains of learning: Cognitive, affective and psychomotor. *The Journal of EFL Education and Research*, 2(2), 45-52.
- Hosnjak, A. M., Ilic, B., Kurtovic, B., Ledinski, F. S., & Smrekar, M. (2020). Development strategies in the field of lifelong learning of older adults. *Acta Medica Martiniana*, 20(3), 122-132. <https://doi.org/10.2478/acm-2020-0014>
- Hughes, T. F. (2010). Promotion of cognitive health through cognitive activity in the aging population. *Aging health*, 6(1), 111-121. <https://doi.org/10.2217/ahe.09.89>
- Hultsch, D. F., Hertzog, C., Small, B. J., & Dixon, R. A. (1999). Use it or lose it: Engaged lifestyle as a buffer of cognitive decline in aging? *Psychology and Aging*, 14(2), 245-263. <https://doi.org/10.1037//0882-7974.14.2.245>
- Jagosh, J., Macaulay, A. C., Pluye, P., Salsberg, J. O. N., Bush, P. L., Henderson, J. I. M., et al. (2012). Uncovering the benefits of participatory research: Implications of a realist review for health research and practice. *The Milbank Quarterly*, 90(2), 311-346. <https://doi.org/10.1111/j.1468-0009.2012.00665.x>
- Jalali, A., Rajati, F., & Kazemini, M. (2025). Empowering the older people on self-care to improve self-efficacy based on Pender's health promotion model: A randomized controlled trial. *Geriatric Nursing*, 61, 574-579. <https://doi.org/10.1016/j.gerinurse.2024.12.020>

- Jenkins, A. (2011). Participation in learning and wellbeing among older adults. *International Journal of Lifelong Education*, 30(3), 403-420. <https://doi.org/10.1080/02601370.2011.570876>
- Jenkins, A., & Mostafa, T. (2015). The effects of learning on wellbeing for older adults in England. *Ageing & society*, 35(10), 2053-2070. <https://doi.org/10.1017/S0144686X14000762>
- Joseph, D., & Human, R. (2020). "It is more than just about music": Lifelong learning, social interaction and connection. *Muziki: Journal of Music Research in Africa*, 17(1), 72-93. <https://doi.org/10.1080/18125980.2020.1855082>
- Kail, R., & Salthouse, T. A. (1994). Processing speed as a mental capacity. *Acta Psychologica*, 86(2-3), 199-225. [https://doi.org/10.1016/0001-6918\(94\)90003-5](https://doi.org/10.1016/0001-6918(94)90003-5)
- Kaźmierczak, I., Zajenkowska, A., Rogoza, R., Jonason, P. K., & Ścigala, D. (2023). Self-selection biases in psychological studies: Personality and affective disorders are prevalent among participants. *PLOS One*, 18(3), Article e0281046. <https://doi.org/10.1371/journal.pone.0281046>
- Kekäläinen, T., Kokko, K., Tammelin, T., Sipilä, S., & Walker, S. (2018). Motivational characteristics and resistance training in older adults: A randomized controlled trial and 1-year follow-up. *Scandinavian Journal of Medicine & Science in Sports*, 28(11), 2416-2426. <https://doi.org/10.1111/sms.13236>
- Kenner, C., Ruby, M., Jessel, J., Gregory, E., & Arju, T. (2007). Intergenerational learning between children and grandparents in East London. *Journal of Early Childhood Research*, 5(3), 219-243. <https://doi.org/10.1177/1476718X07080471>
- Kim, A., & Merriam, S. B. (2004). Motivations for learning among older adults in a learning in retirement institute. *Educational gerontology*, 30(6), 441-455. <https://doi.org/10.1080/03601270490445069>
- Kim, E. J., Kim, T., Conigliaro, J., Liebschutz, J. M., Paasche-Orlow, M. K., & Hanchate, A. D. (2018). Racial and ethnic disparities in diagnosis of chronic medical conditions in the USA. *Journal of General Internal Medicine*, 33, 1116-1123. <https://doi.org/10.1007/s11606-018-4471-1>
- Kim, M., & Park, J. M. (2017). Factors affecting cognitive function according to gender in community-dwelling elderly individuals. *Epidemiology and Health*, 39, Article e2017054. <https://doi.org/10.4178/epih.e2017054>
- Kirk, A. (2024). Cognition in normal aging—A Brief review. *Canadian Journal of Neurological Sciences*, 51(2), 157-160. <https://doi.org/10.1017/cjn.2023.259>
- Knowles, M. S. (1968). Andragogy, not pedagogy. *Adult Leadership*, 16(10), 350-352.

- Knox, J., Morgan, P., Kay-Lambkin, F., Wilson, J., Wallis, K., Mallise, C., Barclay, B., & Young, M. (2023). Male involvement in randomised trials testing psychotherapy or behavioural interventions for depression: a scoping review. *Current Psychology*, 42(34), 30322-30337. <https://doi.org/10.1007/s12144-022-04017-7>
- Koh, W. Q., Ludlow, K., Liddle, J., & Pachana, N. A. (2025). Selection, optimization, and compensation strategies used by older adults to live well with technology: Qualitative study. *JMIR Aging*, 8(1), e75019. <https://doi.org/10.2196/75019>
- Konkel, L. (2015). Racial and ethnic disparities in research studies: The challenge of creating more diverse cohorts. *Environmental Health Perspectives*, 123(12), A297–A302. <https://doi.org/10.1289/ehp.123-A297>
- Kuldas, S., Satyen, L., Ismail, H. N., & Hashim, S. (2014). Greater cognitive effort for better learning: Tailoring an instructional design for learners with different levels of knowledge and motivation. *Psychologica Belgica*, 54(4), 350–373. <https://doi.org/10.5334/pb.aw>
- Kump, S., & Krašovec, S. J. (2007). Education: A possibility for empowering older adults. *International Journal of Lifelong Education*, 26(6), 635-649. <https://doi.org/10.1080/02601370701711331>
- Laal, M. (2011). Barriers to lifelong learning. *Procedia-Social and Behavioral Sciences*, 28, 612-615. <https://doi.org/10.1016/j.sbspro.2011.11.116>
- Laal, M., & Laal, A. (2012). Challenges for lifelong learning. *Procedia-Social and Behavioral Sciences*, 47, 1539-1544. <https://doi.org/10.1016/j.sbspro.2012.06.857>
- Laal, M., & Salamati, P. (2012). Lifelong learning; why do we need it? *Procedia-Social and Behavioral Sciences*, 31, 399-403. <https://doi.org/10.1016/j.sbspro.2011.12.073>
- Laganà , L. (2008). Enhancing the attitudes and self-efficacy of older adults toward computers and the internet: Results of a pilot study. *Educational Gerontology*, 34(9), 831-843. <https://doi.org/10.1080/03601270802243713>
- Laganà, L., Oliver, T., Ainsworth, A., & Edwards, M. (2011). Enhancing computer self-efficacy and attitudes in multi-ethnic older adults: a randomised controlled study. *Ageing & Society*, 31(6), 911-933. <https://doi.org/10.1017/S0144686X10001340>
- Larnyo, E., Dai, B., Nutakor, J. A., Ampon-Wireko, S., Larnyo, A., & Appiah, R. (2022). Examining the impact of socioeconomic status, demographic characteristics, lifestyle and other risk factors on adults' cognitive functioning in developing countries: An analysis of five selected WHO SAGE wave 1 countries. *International Journal for Equity in Health*, 21, Article 31. <https://doi.org/10.1186/s12939-022-01622-7>

- Law, V. T., Yee, H. H., Ng, T. K., & Fong, B. Y. (2023). Evaluating the impact of lifelong education on older adults: A case study from Hong Kong. *Journal of Adult and Continuing Education*, 29(2), 643-658.
<https://doi.org/10.1177/14779714231156747>
- Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist*, 19(3), 179-186.
https://doi.org/10.1093/geront/9.3_Part_1.179
- Leanos, S., Kürüm, E., Strickland-Hughes, C. M., Ditta, A. S., Nguyen, G., Felix, M., Yum, H., Rebok, G., & Wu, R. (2023). The impact of learning multiple real-world skills on cognitive abilities and functional independence in healthy older adults. *The Journals of Gerontology: Series B*, 78(8), 1305-1317.
<https://doi.org/10.1093/geronb/gbad053>
- Lee, C. C., Czaja, S. J., & Sharit, J. (2008). Training older workers for technology-based employment. *Educational Gerontology*, 35(1), 15-31.
<https://doi.org/10.1080/03601270802300091>
- Lee, J., & Kim, H. J. (2022). Normal aging induces changes in the brain and neurodegeneration progress: Review of the structural, biochemical, metabolic, cellular, and molecular changes. *Frontiers in Aging Neuroscience*, 14, Article 931536. <https://doi.org/10.3389/fnagi.2022.931536>
- Leung, A., I. Chi, and Y. H. Lui. (2006). A cross-cultural study in older adults' learning experience. *Asian Journal of Gerontology & Geriatrics*, 1, 78-83.
- Leung, D. S., & Liu, B. C. (2011). Lifelong education, quality of life and self-efficacy of Chinese older adults. *Educational Gerontology*, 37(11), 967-981.
<https://doi.org/10.1080/03601277.2010.492732>
- Levchenko, O., Levchenko, A., Horpynchenko, O., & Tsarenko, I. (2018). The impact of lifelong learning on the country's development in dimension of innovative oriented economy: Comparative analysis. *Journal of Applied Economic Sciences*, 7(61), 2076-2083.
- Levkoff, S., & Sanchez, H. (2003). Lessons learned about minority recruitment and retention from the centers on minority aging and health promotion. *The Gerontologist*, 43(1), 18-26. <https://doi.org/10.1093/geront/43.1.18>
- Levy, B. (2009). Stereotype embodiment: A psychosocial approach to aging. *Current Directions in Psychological Science*, 18(6), 332-336.
<https://doi.org/10.1111/j.1467-8721.2009.01662.x>
- Levy, B. R., & Myers, L. M. (2004). Preventive health behaviors influenced by self-perceptions of aging. *Preventive Medicine*, 39(3), 625-629.
<https://doi.org/10.1016/j.ypmed.2004.02.029>

- Lewis, N. A., & Hill, P. L. (2020). Does being active mean being purposeful in older adulthood? Examining the moderating role of retirement. *Psychology and Aging*, 35(7), 1050-1057. <https://doi.org/10.1037/pag0000568>
- Lezak, M. D., Howieson, D. B., Bigler, E. D., & Tranel, D. (2012). *Neuropsychological assessment* (5th ed.). Oxford University Press.
- Lin, C. H., Lin, E., & Lane, H. Y. (2017). Genetic biomarkers on age-related cognitive decline. *Frontiers in Psychiatry*, 8, Article 247. <https://doi.org/10.3389/fpsy.2017.00247>
- Lindeman, D. A. (2017). Improving the independence of older adults through technology: Directions for public policy. *Public Policy & Aging Report*, 27(2), 49-52. <https://doi.org/10.1093/ppar/prx011>
- Lin, L., Liao, S., Yan, Z., Liu, C., Wang, Q., & Wang, F. (2024). The level of expectations regarding aging among older adults: A systematic review and meta-analysis. *Journal of the American Medical Directors Association*, 25(3), 410-416. <https://doi.org/10.1016/j.jamda.2023.08.027>
- Liu, T., Chan, R., Yeung, C., Lee, L. C. B., Chan, T. N. C., Welton, K., Lum, T. Y., & Wong, G. H. Y. (2023). “Participation is fun and empowering”: A participatory approach to co-design a cultural art program for older Chinese at risk of depression in Hong Kong. *Innovation in Aging*, 7(5), Article igad041. <https://doi.org/10.1093/geroni/igad041>
- Li, Y., Shi, H., Yuan, Y., Zeng, R., Bai, B., & Sun, L. (2023). The impact of learning engagement on the subjective well-being of disadvantaged older adults in China. *Frontiers in Public Health*, 11. <https://doi.org/10.3389/fpubh.2023.1196692>
- Li, Y., Yan, C., Chen, R., Lu, H., & Shan, Y. (2025). Impact of learning motivation and presentation modalities on cognitive load and learning performance in preoperative digital health education for older patients with knee arthroplasty: Psychobehavioral experimental study. *Journal of Medical Internet Research*, 27, e79430. <https://doi.org/10.2196/79430>
- Lövdén, M., Fratiglioni, L., Glymour, M. M., Lindenberger, U., & Tucker-Drob, E. M. (2020). Education and cognitive functioning across the life span. *Psychological Science in the Public Interest*, 21(1), 6–41. <https://doi.org/10.1177/1529100620920576>
- Lozoya, S. V. M., Guirado, M. A. Z., González, A. Z., & López, A. B. M. (2022). Use of technologies and self-efficacy in older adults. *IEEE Revista Iberoamericana de Tecnologías Del Aprendizaje*, 17(2), 125-130. <https://doi.org/10.1109/RITA.2022.3166870>

- Luchsinger, J. A., Tang, M. X., Stern, Y., Shea, S., & Mayeux, R. (2001). Diabetes mellitus and risk of Alzheimer's disease and dementia with stroke in a multiethnic cohort. *American Journal of Epidemiology*, 154(7), 635–641. <https://doi.org/10.1093/aje/154.7.635>
- Luszcz, M. A., & Bryan, J. (1999). Toward understanding age-related memory loss in late adulthood. *Gerontology*, 45(1), 2-9. <https://doi.org/10.1159/000022048>
- Lyndgaard, S. F., Tatel, C. E., Pham, V., Melkers, J. E., & Kanfer, R. (2024). Towards a multidimensional measure of self-efficacy in the adult learning ecosystem. *International Journal of Lifelong Education*, 43(6), 579-602. <https://doi.org/10.1080/02601370.2024.2369895>
- Mani, A., Mullainathan, S., Shafr, E., & Zhao, J. (2020). Scarcity and cognitive function around payday: A conceptual and empirical analysis. *Journal of the Association for Consumer Research*, 5, 365–376. <https://doi.org/10.1086/709885>
- Marchant, N. L., Hossain, E., Chen, S., Kabra, G., Ahmad, L., Fraser, I., Cezair-Phillip, L., Fotoupoulou, A., Sihre, H., Mukadam, N., & Cox, A. L. (2025). A multiperspective investigation of the underrepresentation of minoritized ethnic participants in dementia research and proposed strategies to improve inclusive recruitment practices. *Alzheimer's & Dementia*, 21(4), Article e70129. <https://doi.org/10.1002/alz.70129>
- Marden, J. R., Tchetgen Tchetgen, E. J., Kawachi, I., & Glymour, M. M. (2017). Contribution of socioeconomic status at 3 life-course periods to late-life memory function and decline: Early and late predictors of dementia risk. *American Journal of Epidemiology*, 186(7), 805–814. <https://doi.org/10.1093/aje/kwx155>
- Marnfeldt, K., & Wilber, K. (2025). The Safety–Autonomy Grid: A Flexible Framework for Navigating Protection and Independence for Older Adults. *The Gerontologist*, 65(6), gnaf111. <https://doi.org/10.1093/geront/gnaf111>
- Mather, M. & Scommegna, P. (2024). *Fact Sheet: Aging in the United States*. Population Reference Bureau. <https://www.prb.org/resources/fact-sheet-aging-in-the-united-states/>
- Matthews, K. A., Xu, W., Gaglioti, A. H., Holt, J. B., Croft, J. B., Mack, D., & McGuire, L. C. (2019). Racial and ethnic estimates of Alzheimer's disease and related dementias in the United States (2015–2060) in adults aged ≥ 65 years. *Alzheimer's & Dementia*, 15(1), 17-24. <https://doi.org/10.1016/j.jalz.2018.06.3063>
- Maulod, A., & Lu, S. Y. (2020). “I’m slowly ageing but I still have my value”: Challenging ageism and empowering older persons through lifelong learning in Singapore. *Educational Gerontology*, 46(10), 628-641. <https://doi.org/10.1080/03601277.2020.1796280>

- McNeish, R., Rigg, K. K., Tran, Q., & Hodges, S. (2019). Community-based behavioral health interventions: Developing strong community partnerships. *Evaluation and Program Planning*, 73, 111-115.
<https://doi.org/10.1016/j.evalprogplan.2018.12.005>
- Meisner, B. A., Weir, P. L., & Baker, J. (2013). The relationship between aging expectations and various modes of physical activity among aging adults. *Psychology of Sport and Exercise*, 14(4), 569-576.
<https://doi.org/10.1016/j.psychsport.2013.02.007>
- Menkin, J. A., Robles, T. F., Gruenewald, T. L., Tanner, E. K., & Seeman, T. E. (2017). Positive expectations regarding aging linked to more new friends in later life. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 72(5), 771-781. <https://doi.org/10.1093/geronb/gbv118>
- Merriam, S. B., & Kee, Y. (2014). Promoting community wellbeing: The case for lifelong learning for older adults. *Adult Education Quarterly*, 64(2), 128-144.
<https://doi.org/10.1177/0741713613513>
- Mezirow, J. (1991). *Transformative dimensions of adult learning*. Jossey-Bass.
<https://doi.org/10.1177/074171369204200309>
- Mezirow, J. (1995). Transformation Theory of Adult Learning. In M. Welton (Ed.), *In Defense of the Lifeworld: Critical Perspectives on Adult Learning* (pp. 37-90). State University of New York Press.
- Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education*, 74, 5–12. <https://doi.org/10.1002/ace.7401>
- Mezirow, J. (2000). *Learning as Transformation: Critical Perspectives on a Theory in Progress*. The Jossey-Bass Higher and Adult Education Series. Jossey-Bass Publishers.
- Moghimi, D., Scheibe, S., & Freund, A. M. (2019). The model of selection, optimization, compensation. In B. Baltes, C. Rudolph, & H. Zacher (Eds.), *Work across the lifespan* (1 ed., pp. 81-110). Elsevier.
<https://doi.org/10.1016/B978-0-12-812756-8.00004-9>
- Molina, M. Á., & Schettini, R. (2021). Lifelong learning and quality of life. In F. Rojo-Perez, & G. Fernandez-Mayoralas (Eds.), *Handbook of active ageing and quality of life: From concepts to applications* (pp. 111-119). Springer.
https://doi.org/10.1007/978-3-030-58031-5_6
- Monsen, K. A. (2018). *Intervention effectiveness research: Quality improvement and program evaluation*. Springer International Publishing.
<https://doi.org/10.1007/978-3-319-61246-1>

- Morris-Foster, J. M. (2024). The Influence of lifelong learning on life satisfaction and successful aging in older adults: A narrative literature review. *Journal of Gerontological Nursing*, 50(8), 11-17.
<https://doi.org/10.3928/00989134-20240702-02>
- Morrow-Howell, N., Tang, F., Kim, J., Lee, M., & Sherraden, M. (2005). Maximizing the productive engagement of older adults. In M. L. Wykle, P. J. Whitehouse, & D. L. Morries (Eds.), *Successful aging through the life span: Intergenerational issues in health* (pp. 19-54).
- Moskowitz, T., Rabinowitz, N., Johnson, E., Huey, E., Kaufer, D., Small, G., Stern, R., Miller, B., Rankin, K., & Possin, K. (2016). The TabCAT brain health assessment: A highly efficient and sensitive approach to detecting very mild cognitive impairment. *Neurology*, 86(16), P5.197.
https://doi.org/10.1212/WNL.86.16_supplement.P5.197
- Murayama, Y., Ohba, H., Yasunaga, M., Nonaka, K., Takeuchi, R., Nishi, M., Sakuma, N., Uchida, H., Shinkai, S., & Fujiwara, Y. (2015). The effect of intergenerational programs on the mental health of elderly adults. *Aging & mental health*, 19(4), 306-314. <https://doi.org/10.1080/13607863.2014.933309>
- Mynatt, E. D., & Rogers, W. A. (2001). Developing technology to support the functional independence of older adults. *Ageing International*, 27(1), 24-41.
<https://doi.org/10.1007/s12126-001-1014-5>
- Narushima, M. (2008). More than nickels and dimes: The health benefits of a community-based lifelong learning programme for older adults. *International Journal of Lifelong Education*, 27(6), 673-692.
<https://doi.org/10.1080/02601370802408332>
- Narushima, M., Liu, J., & Diestelkamp, N. (2013). The association between lifelong learning and psychological well-being among older adults: Implications for interdisciplinary health promotion in an aging society. *Activities, Adaptation & Aging*, 37(3), 239-250. <https://doi.org/10.1080/01924788.2013.816834>
- Narushima, M., Liu, J., & Diestelkamp, N. (2018a). I learn, therefore I am: A phenomenological analysis of meanings of lifelong learning for vulnerable older adults. *The Gerontologist*, 58(4), 696-705. <https://doi.org/10.1093/geront/gnx044>
- Narushima, M., Liu, J., & Diestelkamp, N. (2018b). Lifelong learning in active ageing discourse: Its conserving effect on wellbeing, health and vulnerability. *Ageing & Society*, 38(4), 651-675. <https://doi.org/10.1017/S0144686X16001136>
- Nguyen, C., Leanos, S., Natsuaki, M. N., Rebok, G. W., & Wu, R. (2020). Adaptation for growth via learning new skills as a means to long-term functional independence in

- older adulthood: Insights from emerging adulthood. *The Gerontologist*, 60(1), 4-11. <https://doi.org/10.1093/geront/gny128>
- Nguyen, L., Murphy, K., & Andrews, G. (2025). Older adults' perceptions, experiences, and preferences of a gamified cognitive training program. *International Journal of Human-Computer Interaction*, 41(14), 8624-8638. <https://doi.org/10.1080/10447318.2024.2413283>
- Noble, J. M., Manly, J. J., Schupf, N., Tang, M. X., & Luchsinger, J. A. (2012). Type 2 diabetes and ethnic disparities in cognitive impairment. *Ethnicity & Disease*, 22(1), 38-44. Retrieved from <https://www.jstor.org/stable/48667622>
- Noice, H., Noice, T., & Staines, G. (2004). A short-term intervention to enhance cognitive and affective functioning in older adults. *Journal of Aging and Health*, 16(4), 562-585. <https://doi.org/10.1177/089826430426581>
- Nolin, S. A., Faulkner, M. E., Stewart, P., Fleming, L. L., Merritt, S., Rezaei, R. F., Bharadwaj, P. K., Franchetti, M. K., Raichlen, D. A., Jessup, C. J., Edwards, L., Hishaw, G. A., Etten, E. J. V., Trouard, T. P., Geldmacher, D., Wadley, V. G., Alperin, N., Porges, E. S., Woods, A. J., ... Visscher, K. M. (2025). Network segregation is associated with processing speed in the cognitively healthy oldest-old. *Elife*, 14, e78076. <https://doi.org/10.7554/eLife.78076>
- Opdebeeck, C., Martyr, A., & Clare, L. (2016). Cognitive reserve and cognitive function in healthy older people: A meta-analysis. *Aging, Neuropsychology, and Cognition*, 23(1), 40-60. <https://doi.org/10.1080/13825585.2015.1041450>
- Opitz, B. (2014). Memory function and the hippocampus. *Front Neurol Neurosci*, 34, 51-59. <https://doi.org/10.1159/000356422>
- Ortman, J. M., Velkoff, V. A., & Hogan, H. (2014). *An aging nation: The older population in the United States*. United States Census Bureau. <https://capitolhillvillage.org/wp-content/uploads/2018/11/Census-Data.pdf>
- Palms, J. D., Sol, K., & Zahodne, L. B. (2025). Pathways to racial/ethnic inequalities in Dementia. *Annual Review of Clinical Psychology*, 21, 113-137. <https://doi.org/10.1146/annurev-clinpsy-081423-032631>
- Park, D. C., Lodi-Smith, J., Drew, L., Haber, S., Hebrank, A., Bischof, G. N., & Aamodt, W. (2014). The impact of sustained engagement on cognitive function in older adults: The Synapse Project. *Psychological Science*, 25(1), 103-112. <https://doi.org/10.1177/0956797613499592>
- Park, D. C., & Reuter-Lorenz, P. (2009). The adaptive brain: aging and neurocognitive scaffolding. *Annual review of psychology*, 60(1), 173-196. <https://doi.org/10.1146/annurev.psych.59.103006.093656>

- Park, D. C., & Schwarz, N. (2012). *Cognitive aging: A primer*. Psychology Press.
<https://doi.org/10.4324/9780203727027>
- Peng, P., & Kievit, R. A. (2020). The development of academic achievement and cognitive abilities: A bidirectional perspective. *Child Development Perspectives*, 14(1), 15-20. <https://doi.org/10.1111/cdep.12352>
- Perkins, R., & Williamon, A. (2014). Learning to make music in older adulthood: A mixed-methods exploration of impacts on wellbeing. *Psychology of Music*, 42(4), 550-567. <https://doi.org/10.1177/0305735613483668>
- Phipps, S. T., Prieto, L. C., & Ndinguri, E. N. (2013). Teaching an old dog new tricks: investigating how age, ability, and self efficacy influence intentions to learn and learning among participants in adult education. *Academy of Educational Leadership Journal*, 17, 13.
- Pinheiro, J. C. (2014). Linear mixed effects models for longitudinal data. *Wiley StatsRef: Statistics Reference Online*. <https://doi.org/10.1002/9781118445112.stat05514>
- Pinto, C., & Tandel, K. Y. (2016). Cognitive reserve: Concept, determinants, and promotion. *Journal of Geriatric Mental Health*, 3(1), 44-51.
<https://doi.org/10.4103/2348-9995.181916>
- Porsteinsson, A. P., Isaacson, R. S., Knox, S., Sabbagh, M. N., & Rubino, I. (2021). Diagnosis of early Alzheimer's disease: Clinical practice in 2021. *The Journal of Prevention of Alzheimer's Disease*, 8(3), 371-386.
<https://doi.org/10.14283/jpad.2021.23>
- Pstross, M., Corrigan, T., Knopf, R. C., Sung, H., Talmage, C. A., Conroy, C., & Fowley, C. (2017). The benefits of intergenerational learning in higher education: Lessons learned from two age friendly university programs. *Innovative Higher Education*, 42(2), 157-171. <https://doi.org/10.1007/s10755-016-9371-x>
- Purdie, N., & Boulton-Lewis, G. (2003). The learning needs of older adults. *Educational Gerontology*, 29(2), 129-149. <https://doi.org/10.1080/713844281>
- Raemdonck, I., Beusaert, S., Fröhlich, D., Kochoian, N., & Meurant, C. (2014). Aging workers' learning and employability. In P. M. Bal, D. T. A. M. Kooij, D. M. Rousseau (Eds.) *Aging workers and the employee-employer relationship* (pp. 163-184). Springer International Publishing.
- Radhamani, K., & Kalaivani, D. (2021). Academic resilience among students: A review of literature. *International Journal of Research and Review*, 8(6), 360-369.
<https://doi.org/10.52403/ijrr.20210646>

- Raz, N., Rodrigue, K. M., Head, D., Kennedy, K. M., & Acker, J. D. (2004). Differential aging of the medial temporal lobe: A study of a five-year change. *Neurology*, 62(3), 433-438. <https://doi.org/10.1212/01.WNL.0000106466.09835.46>
- R Core Team (2023). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. <https://www.R-project.org/>
- Rebok, G. W. (2016). Selecting control groups: To what should we compare behavioral interventions. In L. N. Gitlin & S. J. Czaja (Eds.), *Behavioral intervention research: Designing, evaluating, and implementing* (pp. 139-159). Springer Publishing Company. <https://doi.org/10.1891/9780826126597.0008>
- Rebok, G. W., Rodriguez, T. M., & Wu, R. (2024). Resilient cognitive aging in Latinx and Mexican American populations. In J. L. Angel, F. C. Drumond Andrade, F. Riosmena, S. & Mejia-Arango (Eds.), *Older Mexican and Latinos in the United States* (pp. 59-77). Springer. https://doi.org/10.1007/978-3-031-48809-2_4
- Requena, C., Plaza-Carmona, M., Álvarez-Merino, P., & López-Fernández, V. (2024). Technological applications to enhance independence in daily activities for older adults: A systematic review. *Frontiers in Public Health*, 12, 1476916. <https://doi.org/10.3389/fpubh.2024.1476916>
- Rey, A. (1964). *L'examen clinique en psychologie*. Presses Universitaires De France.
- Richards, M., Sacker, A., & Deary, I. J. (2013). Lifetime antecedents of cognitive reserve. In Y. Stern (Ed.), *Cognitive reserve: Theory and Applications* (pp. 37-52). Psychology Press.
- Rodrigues, P. F., & Pandeirada, J. N. (2015). Attention and working memory in elderly: The influence of a distracting environment. *Cognitive Processing*, 16(1), 97-109. <https://doi.org/10.1007/s10339-014-0628-y>
- Rodriguez, T. M., Boot, W., & Wu, R. (2025b). Promoting technology access and learning among underserved older adults. *Journal of the International Society of Gerontechnology*, 24(1), 1-20. <https://doi.org/10.4017/gt.2025.24.1.1164.5>
- Rodriguez, T. M., Neri, X. & Wu, R. (2025a). Identifying learning barriers, engagement, and interests among low-income Latino older adults. *Journal of Aging and Health*, 37(3-4_suppl), 53S-65S. <https://doi.org/10.1177/08982643241309135>
- Rodriguez, T. M., Sheffler, P., Ferguson, L. E., Rebok, G. W., & Wu, R. (2022). Cognitive and functional improvement via novel skill learning for low-income minoritized middle-aged and older adults. *Prevention Science*, 24, 926-935. <https://doi.org/10.1007/s11121-022-01413-0>
- Rowe, J. W., & Kahn, R. L. (1987). Human aging: Usual and successful. *Science*, 237(4811), 143-149. <https://doi.org/10.1126/science.329970>

- Rowe, J. W., & Kahn, R. L. (1997). Successful aging. *The Gerontologist*, 37(4), 433–440. <https://doi.org/10.1093/geront/3.4.433>
- Ruiz, M. E., & Ransford, H. E. (2012). Latino elders reframing familismo: Implications for health and caregiving support. *Journal of Cultural Diversity*, 19(2), 50-57.
- Russell, S. S. (2006). An overview of adult-learning processes. *Urologic Nursing*, 26(5), 329-370.
- Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology*, 25(1), 54-67. <https://doi.org/10.1006/ceps.1999.1020>
- Rychetnik, L., Frommer, M., Hawe, P., & Shiell, A. (2002). Criteria for evaluating evidence on public health interventions. *Journal of Epidemiology & Community Health*, 56(2), 119-127. <https://doi.org/10.1136/jech.56.2.119>
- Sabatini, S., Pagnini, F., Pederiva, A. M., Henderson, E., Cheval, B., Borella, E., Fuente-Nunez, V., Gerstorf, D., Mezza, F., Neupert, S. D., Rupprecht, F. S., Villar, F., Windsor, T. D., Wurm, S., & Mataró, M. (2025). Reframing Expectations about aging—Physical Activity and Inclusive Reappraisal (RE-PAIR): Protocol of an intervention promoting positive self-perceptions of aging and physical activity in older couples. *BMC Geriatrics*. <https://doi.org/10.21203/rs.3.rs-7335145/v1>
- Sabogal, F., Marín, G., Otero-Sabogal, R., Marín, B. V., & Perez-Stable, E. J. (1987). Hispanic familism and acculturation: What changes and what doesn't? *Hispanic Journal of Behavioral Sciences*, 9(4), 397-412. <https://doi.org/10.1177/07399863870094003>
- Salthouse, T. (2012). Consequences of age-related cognitive declines. *Annual Review of Psychology*, 63(1), 201-226. <https://doi.org/10.1146/annurev-psych-120710-100328>
- Salthouse, T. A. (2019). Trajectories of normal cognitive aging. *Psychology and Aging*, 34(1), 17–24. <https://doi.org/10.1037/pag0000288>
- Salthouse, T. A., & Prill, K. A. (1987). Inferences about age impairments in inferential reasoning. *Psychology and Aging*, 2(1), 43–51. <https://doi.org/10.1037/0882-7974.2.1.43>
- Salthouse, T. A., Fristoe, N. M., Lineweaver, T. T., & Coon, V. E. (1995). Aging of attention: Does the ability to divide decline? *Memory & Cognition*, 23, 59-71. <https://doi.org/10.3758/BF03210557>
- Salthouse, T. A., Mitchell, D. R., Skovronek, E., & Babcock, R. L. (1989). Effects of adult age and working memory on reasoning and spatial abilities. *Journal of*

- Experimental Psychology: Learning, Memory, and Cognition*, 15(3), 507.
<https://doi.org/10.1037//0278-7393.15.3.507>
- Sarkisian, C. A., Hays, R. D., Berry, S., & Mangione, C. M. (2002b). Development, reliability, and validity of the expectations regarding aging (ERA-38) survey. *The Gerontologist*, 42(4), 534-542. <https://doi.org/10.1093/geront/42.4.534>
- Sarkisian, C. A., Hays, R. D., & Mangione, C. M. (2002a). Do older adults expect to age successfully? The association between expectations regarding aging and beliefs regarding healthcare seeking among older adults. *Journal of the American Geriatrics Society*, 50(11), 1837-1843.
<https://doi.org/10.1046/j.1532-5415.2002.50513.x>
- Sarkisian, C. A., Prohaska, T. R., Wong, M. D., Hirsch, S., & Mangione, C. M. (2005a). The relationship between expectations for aging and physical activity among older adults. *Journal of General Internal Medicine*, 20(10), 911-915.
<https://doi.org/10.1111/j.1525-1497.2005.0204.x>
- Sarkisian, C. A., Steers, W. N., Hays, R. D., & Mangione, C. M. (2005b). Development of the 12-item expectations regarding aging survey. *The Gerontologist*, 45(2), 240-248. <https://doi.org/10.1093/geront/45.2.240>
- Savage, B., Foli, K. J., Edwards, N. E., & Abrahamson, K. (2016). Familism and health care provision to Hispanic older adults. *Journal of Gerontological Nursing*, 42(1), 21-29. <https://doi.org/10.3928/00989134-20151124-03>
- Schaie, K. W. (1996). *Intellectual development in adulthood: The Seattle Longitudinal Study*. Cambridge University Press.
- Scott, J. E., Luszcz, M. A., Walker, R., Mazzucchelli, T., & Windsor, T. D. (2023). Barriers to activity engagement in older adulthood: Results of a community survey. *Australasian Journal on Ageing*, 42(1), 176-184.
<https://doi.org/10.1111/ajag.13124>
- Shi, Y., & Qu, S. (2022). The effect of cognitive ability on academic achievement: The mediating role of self-discipline and the moderating role of planning. *Frontiers in Psychology*, 13, 1014655. <https://doi.org/10.3389/fpsyg.2022.1014655>
- Schneiderman, N., Llabre, M., Cowie, C. C., Barnhart, J., Carnethon, M., Gallo, L. C., Giachello, A. L., Heiss, G., Kaplan, R. C., LaVange, L. M., Teng, Y., Villa-Caballero, L., & Avilés-Santa, M. L. (2014). Prevalence of diabetes among Hispanics/Latinos from diverse backgrounds: The Hispanic community health study/study of Latinos (HCHS/SOL). *Diabetes Care*, 37(8), 2233-2239.
<https://doi.org/10.2337/dc13-2939>
- Schultz, S. A., Larson, J., Oh, J., Kosciak, R., Dowling, M. N., Gallagher, C. L., Carlsson, C. M., Rowley, H. A., Bendlin, B. B., Asthana, A., Hermann, B. P., Johnson, S.

- C., Sager, M., LaRue, A., & Okonkwo, O. C. (2015). Participation in cognitively-stimulating activities is associated with brain structure and cognitive function in preclinical Alzheimer's disease. *Brain Imaging and Behavior*, 9, 729-736. <https://doi.org/10.1007/s11682-014-9329-5>
- Schunk, D. H. (1995). Self-efficacy, motivation, and performance. *Journal of Applied Sport Psychology*, 7(2), 112-137. <https://doi.org/10.1080/10413209508406961>
- Schwartz, B. S., Glass, T. A., Bolla, K. I., Stewart, W. F., Glass, G., Rasmussen, M., et al. (2004). Disparities in cognitive functioning by race/ethnicity in the Baltimore memory study. *Environmental Health Perspectives*, 112(3), 314-320. <https://doi.org/10.1289/ehp.6727>
- Seinfeld, S., Figueroa, H., Ortiz-Gil, J., & Sanchez-Vives, M. V. (2013). Effects of music learning and piano practice on cognitive function, mood and quality of life in older adults. *Frontiers in Psychology*, 4, Article 810. <https://doi.org/10.3389/fpsyg.2013.00810>
- Sella, E., Carbone, E., Vincenzi, M., Toffalini, E., & Borella, E. (2023). Efficacy of memory training interventions targeting metacognition for older adults: A systematic review and meta-analysis. *Aging & Mental Health*, 27(4), 674-694. <https://doi.org/10.1080/13607863.2022.2122931>
- Seppala, E., Rossomando, T., & Doty, J. R. (2013). Social connection and compassion: Important predictors of health and well-being. *Social Research: An International Quarterly*, 80(2), 411-430. <https://doi.org/10.1353/sor.2013.0027>
- Shankar, S. K. (2010). Biology of aging brain. *Indian Journal of Pathology and Microbiology*, 53(4), 595-604. <https://doi.org/10.4103/0377-4929.71995>
- Shapira, N., Barak, A., & Gal, I. (2007). Promoting older adults' well-being through Internet training and use. *Aging & Mental Health*, 11(5), 477-484. <https://doi.org/10.1080/13607860601086546>
- Sharit, J., & Czaja, S. J. (2020). Overcoming older adult barriers to learning through an understanding of perspectives on human information processing. *Journal of Applied Gerontology*, 39(3), 233-241. <https://doi.org/10.1177/0733464818794574>
- Shedlin, M. G., Decena, C. U., Mangadu, T., & Martinez, A. (2011). Research participant recruitment in Hispanic communities: Lessons learned. *Journal of Immigrant and Minority Health*, 13(2), 352-360. <https://doi.org/10.1007/s10903-009-9292-1>
- Sheffler, P., Rodriguez, T. M., Cheung, C. S., & Wu, R. (2022). Cognitive and metacognitive, motivational, and resource considerations for learning new skills across the lifespan. *Wiley Interdisciplinary Reviews: Cognitive Science*, 13(2), e1585. <https://doi.org/10.1002/wcs.1585>

- Simone, P. M., & Scuilli, M. (2006). Cognitive benefits of participation in lifelong learning institutes. *Lifelong Learning Institute Review*, 1, 44-51.
- Sivadas, A., & Broadie, K. (2020). How Does My Brain Communicate with My Body? *Frontiers for Young Minds*, 8, Article 540970. <https://doi.org/10.3389/frym.2020.540970>
- Sloan, F. A., & Wang, J. (2005). Disparities among older adults in measures of cognitive function by race or ethnicity. *The Journals of Gerontology: Series B*, 60(5), P242–P250. <https://doi.org/10.1093/geronb/60.5.P242>
- Sloane-Seale, A., & Kops, B. (2008). Older adults in lifelong learning: Participation and successful aging. *Canadian Journal of University Continuing Education*, 34(1), 37-62. <https://doi.org/10.21225/D5PC7R>
- Steel, A., Karunaratne, N., Exintaris, B., James, S., Al-Juhaishi, A., Don, A., Dai, D. W., & Lim, A. (2024). The impact of resilience on academic performance with a focus on mature learners. *BMC Medical Education*, 24(1), Article 1105. <https://doi.org/10.1186/s12909-024-06099-2>
- Steckler, A., & Linnan, L. (2002). *Process evaluation for public health interventions and research*. Jossey-Bass/Wiley.
- Stephan, Y., Caudroit, J., Jaconelli, A., & Terracciano, A. (2014). Subjective age and cognitive functioning: A 10-year prospective study. *The American Journal of Geriatric Psychiatry*, 22(11), 1180–1187. <https://doi.org/10.1016/j.jagp.2013.03.007>
- Stern, Y. (2002). What is cognitive reserve? Theory and research application of the reserve concept. *Journal of the International Neuropsychological Society*, 8(3), 448–460. doi:10.1017/S1355617702813248
- Stieger, M., & Lachman, M. E. (2021). Increases in cognitive activity reduce aging-related declines in executive functioning. *Frontiers in Psychiatry*, 12, Article 708974. <https://doi.org/10.3389/fpsy.2021.708974>
- Stierman, B., Afful, J., Carroll, M. D., Chen, T. C., Davy, O., Fink, S., Fryar, C. D., Gu, Q., Hales, C. M., Hughes, J. P., Ostchega, Y., Storandt, R., & Akinbami, L. J. (2021). National health and nutrition examination survey 2017–march 2020 prepandemic data files development of files and prevalence estimates for selected health outcomes. *National Health Statistics Reports*, (158), Article 10. <https://doi.org/10.15620/cdc:106273>
- Strom, R. D., & Strom, S. K. (1995). Intergenerational learning: Grandparents in the schools. *Educational Gerontology: An International Quarterly*, 21(4), 321-335. <https://doi.org/10.1080/0360127950210403>

- Sturm, J., Dierick, A., Christianen, M., van Gelder, M., & Wouters, E. (2023, May). Possibilities, patience, and perseverance: A preliminary analysis of the needs and experiences of ten older adults regarding their use of digital health technology. *Healthcare* 11(11), Article 1612. <https://doi.org/10.3390/healthcare11111612>
- Suyono, H. (2021). Integrating the Elderly in Society with Lifelong Learning Programmes: Indonesian Experiences. In P. Narot & N. Kiettikunwong (Eds.), *Education for the Elderly in the Asia Pacific* (vol 59, pp. 205-217). Springer. https://doi.org/10.1007/978-981-16-3326-3_12
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12(2), 257-285. [https://doi.org/10.1016/0364-0213\(88\)90023-7](https://doi.org/10.1016/0364-0213(88)90023-7)
- Taki, Y., Kinomura, S., Sato, K., Goto, R., Kawashima, R., & Fukuda, H. (2011). A longitudinal study of gray matter volume decline with age and modifying factors. *Neurobiology of Aging*, 32(5), 907-915. <https://doi.org/10.1016/j.neurobiolaging.2009.05.003>
- Talmage, C. A., Mark, R., Slowey, M., & Knopf, R. C. (2018b). Age friendly universities and engagement with older adults: Moving from principles to practice. In B. Findsen (Ed.), *Fresh perspectives on later life learning* (1st ed, pp. 65-82). Routledge.
- Talmage, C. A., Ross, A., Searle, M. S., & Knopf, R. C. (2018a). The social and cognitive transformation of older adult women: An analysis of community well-being for a university-based lifelong learning community. *International Journal of Community Well-Being*, 1, 11-31. <https://doi.org/10.1007/s42413-018-0003-3>
- Talmelli, L. F. D. S., Gratão, A. C. M., Kusumota, L., & Rodrigues, R. A. P. (2010). Functional independence level and cognitive deficit in elderly individuals with Alzheimer's disease. *Revista da Escola de Enfermagem da USP*, 44(4), 933-939. <https://doi.org/10.1590/S0080-62342010000400011>
- Tam, M. (2018). Evaluation of third age learning in Hong Kong: Why and how? *Educational Gerontology*, 44(11), 724-731. <https://doi.org/10.1080/03601277.2018.1555208>
- Tashakkori, A., Teddlie, C., & Sines, M. C. (2013). Utilizing mixed methods in psychological research. In J. A. Schinka, W. F. Velicer, & I. B. Weiner (Eds.), *Handbook of psychology: Research methods in psychology* (2nd ed., pp. 428-450). John Wiley & Sons, Inc.
- Tavakoly Sany, S. B., Ahangari, H., Rasoulifar, A., Salimi, M., Jamali, J., & Tehrani, H. (2024). Nutrition self-efficacy intervention to improve nutritional status of Iranian

- older adults. *Journal of Health, Population and Nutrition*, 43(1), 22.
<https://doi.org/10.1186/s41043-024-00519-1>
- Thalmayer, A. G., Toscanelli, C., & Arnett, J. J. (2021). The neglected 95% revisited: Is American psychology becoming less American? *American Psychologist*, 76(1), 116–129. <https://doi.org/10.1037/amp0000622>
- Ticha, Z., Georgi, H., Schmand, B., Heissler, R., & Kopecek, M. (2023). *Processing speed predicts SuperAging years later. BMC Psychology*, 11, 34.
<https://doi.org/10.1186/s40359-023-01069-7>
- Thomas, D. R. (2003). A general inductive approach for qualitative data analysis. *American Journal of Evaluation*, 27(2), 237–246.
<https://doi.org/10.1177/1098214005283748>
- Tombaugh, T. N., Kozak, J., & Rees, L. (1999) Normative data stratified by age and education for two measures of verbal fluency: FAS and animal naming. *Archives of Clinical Neuropsychology*, 14(2), 167–177.
[https://doi.org/10.1016/S0887-6177\(97\)00095-4](https://doi.org/10.1016/S0887-6177(97)00095-4)
- Tran, T. P. T., Cormier, J. C., Hopwood, C. A., Foster, J., Scheib, I., Li, F., Dolan, K. A., Lynch, N. A., Aycock, D. M., Spears, C. A., Stauber, C. E., Owen-Smith, A. A., Arias, J. J., Pechacek, T. F., & Popova, L. (2025). Building trust for community-engaged research: recommendations from a qualitative study. *Journal of Participatory Research Methods*, 6(2), 74–98.
<https://doi.org/10.35844/001c.131692>
- Tully-Wilson, C., Bojack, R., Millear, P. M., Stallman, H. M., Allen, A., & Mason, J. (2021). Self-perceptions of aging: A systematic review of longitudinal studies. *Psychology and Aging*, 36(7), 773–789. <https://doi.org/10.1037/pag0000638>
- Tun, P. A., & Lachman, M. E. (2006). Telephone assessment of cognitive function in adulthood: The Brief Test of Adult Cognition by Telephone. *Age and Ageing*, 35(6), 629–632. <https://doi.org/10.1093/ageing/afl095>
- Tzuang, M., Owusu, J. T., Spira, A. P., Albert, M. S., & Rebok, G. W. (2018). Cognitive training for ethnic minority older adults in the United States: A review. *The Gerontologist*, 58(5), e311–e324. <https://doi.org/10.1093/geront/gnw260>
- U.S. Census Bureau (2017). *United States population trends and educational attainment: Educational attainment by race and ethnicity*. American Council on Education.
<https://www.equityinhighered.org/indicators/u-s-population-trends-and-educational-attainment/educational-attainment-by-race-and-ethnicity/>
- van Kampen, E., van den Berg, F., Brouwer, J., & Keijzer, M. (2023). Never too old to learn-third age adults experience little (self-) ageism or barriers to learning. *Social*

- Sciences & Humanities Open*, 7(1), Article 100384.
<https://doi.org/10.1016/j.ssaho.2022.100384>
- Van Merriënboer, J. J., & Sweller, J. (2005). Cognitive load theory and complex learning: Recent developments and future directions. *Educational Psychology Review*, 17, 147–177. <https://doi.org/10.1007/s10648-005-3951-0>
- Van Nieuwenhove, L., & De Wever, B. (2024). Psychosocial barriers to adult learning and the role of prior learning experiences: A comparison based on educational level. *Adult Education Quarterly*, 74(1), 62-87.
<https://doi.org/10.1177/07417136231147491>
- Vespa, J. E., Armstrong, D. M., & Medina, L. (2018). *Demographic turning points for the United States: Population projections for 2020 to 2060*. United States Census Bureau.
<https://www.census.gov/content/dam/Census/library/publications/2020/demo/p25-1144.pdf>
- Vila-Castelar, C., Fox-Fuller, J. T., Guzmán-Vélez, E., Schoemaker, D., & Quiroz, Y. T. (2022). A cultural approach to dementia—insights from US Latino and other minoritized groups. *Nature Reviews Neurology*, 18(5), 307-314.
<https://doi.org/10.1038/s41582-022-00630-z>
- Von Stumm, S., & Ackerman, P. L. (2013). Investment and intellect: a review and meta-analysis. *Psychological Bulletin*, 139(4), 841–869.
<https://doi.org/10.1037/a0030746>
- Wadley, V. G., Bull, T. P., Zhang, Y., Barba, C., Bryan, R. N., Crowe, M., Desiderio, L., Deutsch, G., Erus, G., Geldmacher, D. S., Go, R., Lassen-Greene, C. L., Mamaeva, O. A., Marson, D. C., McLaughlin, M., Nasrallah, I. M., Owsley, C., Passler, J., Perry, R. T., Pilonieta, G., ... Kennedy, R. E. (2021). Cognitive processing speed is strongly related to driving skills, financial abilities, and other instrumental activities of daily living in persons with mild cognitive impairment and mild dementia. *The Journals of Gerontology: Series A*, 76(10), 1829-1838.
<https://doi.org/10.1093/gerona/glaa312>
- Waite, L. J., Iveniuk, J., & Laumann, E. O. (2014). Social connectedness at older ages and implications for health and well-being. In C. R. Agnew & S. C. South (Eds.), *Interpersonal relationships and health: Social and clinical psychological mechanisms* (pp. 202–231). Oxford University Press.
<https://doi.org/10.1093/acprof:oso/9780199936632.003.0010>
- Walsemann, K. M., & Ailshire, J. A. (2020). Early educational experiences and trajectories of cognitive functioning among US adults in midlife and later. *American Journal of Epidemiology*, 189(5), 403–411.
<https://doi.org/10.1093/aje/kwz276>

- Wang, H. X., MacDonald, S. W., Dekhtyar, S., & Fratiglioni, L. (2017). Association of lifelong exposure to cognitive reserve-enhancing factors with dementia risk: A community-based cohort study. *PLoS Medicine*, 14(3), e1002251. <https://doi.org/10.1371/journal.pmed.1002251>
- Wang, M., Haertel, G., & Walberg, H. (1994). Educational resilience in inner cities. In M. Wang & E. Gordon (Eds), *Educational resilience in inner-city America: Challenges and prospects* (pp. 45-72). Lawrence Erlbaum Associates. <https://doi.org/10.4324/9780203052723>
- Wang, N., Xu, H., Dhingra, R., Xian, Y., McConnell, E. S., Wu, B., & Dupre, M. E. (2025). The impact of later-life learning on trajectories of cognitive function among U.S. older adults. *Innovation in Aging*, 9(5). <https://doi.org/10.1093/geroni/igaf023>
- Wangqiong, Y., Rolf, S., & Sigrid, B. (2021). Academic resilience: Underlying norms and validity of definitions. *Educational Assessment, Evaluation and Accountability*, 33(1), 169-202. <https://doi.org/10.1007/s11092-020-09351-7>
- Weeks, J. C., & Hasher, L. (2014). The disruptive—and beneficial—effects of distraction on older adults' cognitive performance. *Frontiers in Psychology*, 5, 133. <https://doi.org/10.3389/fpsyg.2014.00133>
- Wechsler, D. (1997). *Wechsler Adult Intelligence Scale-III (WAIS-III) manual*. The Psychological Corporation.
- Wei, R., Wang, R., & Wang, J. (2024). Exploring English learning motivation among Chinese older adults. *Language Teaching Research*. <https://doi.org/10.1177/13621688241242175>
- Wenzel, K. C., Van Puymbroeck, M., Lewis, S., McGuire, F., & Vidotto, J. (2024). Characteristics and cognition of older adults engaged in lifelong learning. *Educational Gerontology*, 50(5), 423-442. <https://doi.org/10.1080/03601277.2023.2299647>
- Westerhof, G. J., Miche, M., Brothers, A. F., Barrett, A. E., Diehl, M., Montepare, J. M., Wahl, H.-W., & Wurm, S. (2014). The influence of subjective aging on health and longevity: A meta-analysis of longitudinal data. *Psychology and Aging*, 29(4), 793–802. <https://doi.org/10.1037/a0038016>
- Wettstein, M., Spuling, S. M., Cengia, A., & Nowossadeck, S. (2021). Feeling younger as a stress buffer: Subjective age moderates the effect of perceived stress on change in functional health. *Psychology and Aging*, 36(3), 322–337. <https://doi.org/10.1037/pag0000608>

- Whatley, M. C., & Castel, A. D. (2020). Improving expectations regarding aging in younger adults: a classroom study. *Educational Gerontology*, 46(12), 785-795. <https://doi.org/10.1080/03601277.2020.1826088>
- Whitmer, R. A., Gustafson, D. R., Barrett-Connor, E., Haan, M. N., Gunderson, E. P., & Yaffe, K. (2008). Central obesity and increased risk of dementia more than three decades later. *Neurology*, 71(14), 1057–1064. <https://doi.org/10.1212/01.wnl.0000306313.89165.ef>
- Wibawa, A. P., Nafalski, A., Çakır, G. K., & Teng, M. F. (Eds.). (2026). *The world of life-based learning: Foundations and applications across contexts*. Springer Cham.
- Williams van Rooij, S. (2012). Training older workers: Lessons learned, unlearned, and relearned from the field of instructional design. *Human Resource Management*, 51(2), 281-298. <https://doi.org/10.1002/hrm.21466>
- Wolfe, K., Crompton, C. J., Hoffman, P., & MacPherson, S. E. (2023). Collaborative learning of new information in older age: a systematic review. *Royal Society Open Science*, 10(10), 211595. <https://doi.org/10.1098/rsos.211595>
- Wolfson, N. E., Cavanagh, T. M., & Kraiger, K. (2014). Older adults and technology-based instruction: Optimizing learning outcomes and transfer. *Academy of Management Learning & Education*, 13(1), 26-44. <https://doi.org/10.5465/amle.2012.0056>
- Wong, Y. C., Chen, H., Lee, V. W., Fung, J. Y., & Law, C. K. (2014). Empowerment of senior citizens via the learning of information and communication technology. *Ageing International*, 39(2), 144-162. <https://doi.org/10.1007/s12126-013-9185-4>
- Woods, B., Rai, H. K., Elliott, E., Aguirre, E., Orrell, M., & Spector, A. (2023). Cognitive stimulation to improve cognitive functioning in people with dementia. *Cochrane Database of Systematic Reviews*, (1), Article CD005562. <https://doi.org/10.1002/14651858.CD005562.pub3>
- Worschech, F., Altenmüller, E., Jünemann, K., Sinke, C., Krüger, T. H., Scholz, D. S., ... & Marie, D. (2022). Evidence of cortical thickness increases in bilateral auditory brain structures following piano learning in older adults. *Annals of the New York academy of sciences*, 1513(1), 21-30. <https://doi.org/10.1111/nyas.14762>
- Wright, C. B., DeRosa, J. T., Moon, M. P., Strobino, K., DeCarli, C., Cheung, Y. K., et al. (2021). Race/ethnic disparities in mild cognitive impairment and dementia: The northern Manhattan study. *Journal of Alzheimer's Disease*, 80(3), 1129–1138. <https://doi.org/10.3233/JAD-201370>

- Wu, R., Farias Lopes de Queiroz, I., Rodriguez, T. M., Tavenner, B. P., & Church, J. A. (2024). Interrupted learning across the lifespan. *Human Development*, 69(2), 65-78. <https://doi.org/10.1159/000542216>
- Wu, R., Rebok, G. W., & Lin, F. V. (2017). A novel theoretical life course framework for triggering cognitive development across the lifespan. *Human Development*, 59(6), 342-365. <https://doi.org/10.1159/000458720>
- Wu, R., Zhao, J., Cheung, C., Natsuaki, M. N., Rebok, G. W., & Strickland-Hughes, C. M. (2021). Learning as an important privilege: A life span perspective with implications for successful aging. *Human Development*, 65(1), 51-64. <https://doi.org/10.1159/000514554>
- Xiao, C., Patrician, P. A., Montgomery, A. P., Wang, Y., Jablonski, R., & Markaki, A. (2024). Filial piety and older adult caregiving among Chinese and Chinese-American families in the United States: A concept analysis. *BMC nursing*, 23(1), 115. <https://doi.org/10.1186/s12912-024-01789-0>
- Xie, B. (2011). Older adults, e-health literacy, and collaborative learning: An experimental study. *Journal of the American Society for Information Science and Technology*, 62(5), 933-946. <https://doi.org/10.1002/asi.21507>
- Xiong, J., & Zuo, M. (2019). Older adults' learning motivations in massive open online courses. *Educational Gerontology*, 45(2), 82-93. <https://doi.org/10.1080/03601277.2019.1581444>
- Xu, L., Ng, D. T. K., Lee, C. S. Y., Peng, P., & Chu, S. K. W. (2025). A systematic review of digital literacy in lifelong learning for older adults: challenges, strategies, and learning outcomes. *Educational Technology Research and Development*, 73, 3627-3674. <https://doi.org/10.1007/s11423-025-10530-w>
- Yamashita, T., Bardo, A. R., Liu, D., & Yoo, J. W. (2018). Education, lifelong learning and self-rated health in later life in the USA. *Health Education Journal*, 78(3), 328-339. <https://doi.org/10.1177/0017896918809500>
- Yamashita, T., Cummins, P. A., Millar, R. J., Sahoo, S., & Smith, T. J. (2019). Associations between motivation to learn, basic skills, and adult education and training participation among older adults in the USA. *International Journal of Lifelong Education*, 38(5), 538-552. <https://doi.org/10.1080/02601370.2019.1666927>
- Yamashita, T., López, E. B., Stevens, J., & Keene, J. R. (2017). Types of learning activities and life satisfaction among older adults in urban community-based lifelong learning programs. *Activities, Adaptation & Aging*, 41(3), 239-257. <https://doi.org/10.1080/01924788.2017.1310583>

- Yang, H. J., Chen, K. M., & Hsu, H. F. (2021). Motivation theory-based physical activity programme for older adults in residential care facility: A modified Delphi and single-group pretest-posttest study. *International Journal of Older People Nursing*, 16(2), e12355. <https://doi.org/10.1111/opn.12355>
- Yang, S., & Wang, W. (2022). The role of academic resilience, motivational intensity and their relationship in EFL learners' academic achievement. *Frontiers in Psychology*, 12, Article 823537. <https://doi.org/10.3389/fpsyg.2021.823537>
- Yao Jr, J. J. (2020). A theoretical perspective on aging attributions and expectations: Its role in health behaviors and outcomes. *Cogent Psychology*, 7(1). <https://doi.org/10.1080/23311908.2020.1798634>
- Yee, H. H., Fong, B. Y. F., Ng, T. K., & Law, V. T. S. (2022). Healthy ageing and lifelong learning in Hong Kong. In V. T. S. Law, & B. Y. F. Fong (Eds.), *Ageing with dignity in Hong Kong and Asia: Holistic and humanistic care* (Vol. 16, pp. 321-331). Springer Nature. https://doi.org/10.1007/978-981-19-3061-4_22
- Yerkes, R. M., & Dodson, J. D. (1908). The Relation of Strength of Stimulus to Rapidity of Habit-Formation. *Journal of Comparative Neurology and Psychology*, 18, 459-482. <http://dx.doi.org/10.1002/cne.920180503>
- Yi-Yin, L. (2011). *Older adults' motivation to learn in higher education*. Adult Education Research Conference.
- Yu, Z., & Fang, B. (2022). Filial-piety-based family care in Chinese societies. In I. Rajan & S. Mishra (Eds.), *Eldercare issues in China and India* (pp. 89-104). Routledge.
- Zahodne, L. B., Sharifian, N., Kraal, A. Z., Zaheed, A. B., Sol, K., Morris, E. P., Schupf, N., Manly, J. J., & Brickman, A. M. (2021). Socioeconomic and psychosocial mechanisms underlying racial/ethnic disparities in cognition among older adults. *Neuropsychology*, 35(3), 265-275. <https://doi.org/10.1037/neu0000720>
- Zhao, J., & Tamm, B. (2018). Psychological responses to scarcity. In O. Braddick (Ed.), *Oxford research encyclopedia of psychology*. Oxford University Press. <https://doi.org/10.1093/acrefore/9780190236557.013.41>
- Zheng, F. (2025). Lifelong learning dimensions and their associations with late-life cognitive decline: Moderating roles of socioeconomic status and early life education. *Frontiers in Psychology*, 16, 1729306. <https://doi.org/10.3389/fpsyg.2025.1729306>
- Zhu, M., Chen, H., Ding, X., & Li, Z. (2025). Effects of self-perception of aging interventions in older adults: A systematic review and meta-analysis. *The Gerontologist*, 65(4), gnae127. <https://doi.org/10.1093/geront/gnae127>

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, 25(1), 82-91. <https://doi.org/10.1006/ceps.1999.1016>

Appendix A

English Class - TELACU Learning Program - Syllabus

Location and times

TELACU Las Fuentes - Community Room in the 1st Floor

Instructor(s): Arjun Chopra

- **Email:** achop010@ucr.edu

Description

This is an entry level English as a Second Language course designed to help adult learners cultivate basic listening, reading, speaking, and writing skills in English. In this class, we will be focusing on the fundamentals of the English language, with particular attention paid to sight words, fluency, phonics, sentence formation, vocabulary, and comprehension. The class is geared toward learning English skills that are relevant for day-to-day life (e.g., communicating with peers, grocery shop cashiers, medical doctors, restaurant servers, etc.).

Materials

The materials you will need for this class include the pen/pencil, notebook, and folder you have been provided with. You will be assigned worksheets as homework, which you will need to keep organized in your folder. To help your engagement with this class and the related activities involved, you will be asked to do in-class activities as well as homework assignments with another peer part of the class. You are free to choose who you would like to work with.

Learning Objectives

In this class, you will...

- Recognize letters and corresponding sounds
- Form uppercase and lowercase letters
- Utilize phonics to know which letters to use when writing words
- Decode words and comprehend what they read
- Gain an understanding of key vocabulary and phrases used for day-to-day conversations with peers and service providers
- Learn foundational and basic listening, reading, and writing skills in the English language
- Become more comfortable practicing and applying your learned English skills

Schedule of Topics Covered Each Week

Week	Topics	In-Class Activity	Homework Due
<u>Week 0</u> (06/02/25) (06/03/25)	Instructor & Team introduction, Syllabus overview	Class material distribution - Notebooks, bags, pencils/pens	No homework
<u>Week 1</u> (06/09/25) (06/10/25)	Daily Communication: Peer Introductions, Greetings, Classroom Commands	Greetings and Introductions - Simple questions and responses	Study and memorize classroom commands and common phrases
<u>Week 2</u> (06/16/25)	Daily Communication: Alphabet, Phonics, Signs, Sentences	Alphabet and basic phonics Reading simple texts (signs, labels)	Write names and simple sentences

(06/17/25)			
<u>Week 3</u> (06/23/25) (06/24/25)	Daily Communication: Grocery Store	Asking for help and finding items Conversations with cashiers	Prices and quantities
<u>Week 4</u> (06/30/25) (07/01/25)	Daily Communication: Grocery Store II	Reading grocery lists and labels Understanding receipts	Writing a shopping list
<u>Week 5</u> (07/07/25) (07/08/25)	Daily communication: Doctor's Office	Describing symptoms and health concerns Understanding doctor's instructions	Making appointments
<u>Week 6</u> (07/14/25) (07/15/25)	Daily Communication: Doctor's Office II	Reading medical forms and instructions Understanding prescription labels	Writing personal information and symptoms
<u>Week 7</u> (07/21/25) (07/22/25)	Daily Communication: Bank & Finances	Opening a bank account Conversations with bank tellers	Asking about services and fees
<u>Week 8</u> (07/28/25) (07/29/25)	Daily Communication: Bank & Finances II	Reading bank statements and forms Understanding financial terms	Writing checks and deposit slips
<u>Week 9</u> (08/04/25) (08/05/25)	Daily Communication: Restaurants	Ordering food and drinks Asking for the bill and understanding it	Conversations with waitstaff
<u>Week 10</u>	Daily Communication:	Reading menus	Writing orders and

(08/11/25)	Restaurants II	Understanding receipts and tipping	preferences
(08/12/25)			
<u>Week 11</u>	Daily Communication: Social Interactions	Asking about hobbies and interests Sharing experiences and opinions	Making small talk
(08/18/25)			
(08/19/25)			
<u>Week 12</u>	Review & Practice	Reading short stories and articles Understanding social cues and idioms	Writing personal anecdotes
(08/25/25)			
(08/26/25)			

Appendix B

Technology Class - TELACU Learning Program - Syllabus

Location and times

TELACU Las Fuentes - Community Room in the 1st Floor

Instructor(s):

- Prithviraj Yuvaraj
 - **Email:** pyuva001@ucr.edu

Description

This class is designed to teach you how to use a smart technological device (specifically a tablet). Whether students are completely unfamiliar or somewhat familiar with technology, this class will provide support and an engaging environment to learn how to effectively use technology. The class will cover basic technology functions and how to navigate more advanced features of a tablet and the internet. For example, it will go over how to install and use specific apps, communicate with others online, look for information online, access and use online benefit portals and resources, and avoid scams and viruses.

Materials

The primary materials needed for this class include the Samsung Tablet you have been provided with for free. By being in this class, you are committed to bring this technological device with you and to use it as instructed, both during class and outside of class. Please follow the guidelines detailed-out in the tablet agreement form that you signed prior to beginning the course. Also, please ensure that you take proper care of the

tablet and that you charge it when needed so that your device is ready to be used during class. You will also need a pen/pencil, a notebook, and a folder to keep your homework, notes, and any related printed materials organized.

To help your engagement with this class and the related activities involved, you will be asked to do in-class activities as well as homework assignments with another peer part of the class. You are free to choose who you would like to work with.

Learning Objectives

In this class, you will...

- Gain confidence in using essential features of a tablet
- Learn to navigate the internet safely and effectively
- Explore social media and other communication platforms to stay connected with family and friends
- Master the basics of email communication and accessing useful online platforms (e.g., for banking, transportation, shopping, etc.),
- Know how to look up free available resources for learning other skills of your interest online
- Learn to access fun content for your entertainment (e.g., YouTube music videos)
- Understand the importance of cybersecurity and how to protect your personal information and avoid being a victim of online fraud

Schedule of Topics Covered Each Week

Week	Topics	In-Class Activity	Homework
------	--------	-------------------	----------

			Assigned
<u>Week 0</u> (06/02/25) (06/03/25)	Instruction & Team Introduction + Syllabus overview + Tablet use agreement	Tablet distribution + set-up	No homework
<u>Week 1</u> (06/09/25) (06/10/25)	Course introduction, aims & expectations, peer introductions, technology vocabulary	What are your concerns regarding technology use?	Create a list of things you would like to use the tablet for and study the technology vocabulary
<u>Week 2</u> (06/16/25) (06/17/25)	Benefits of technology use and basic functions of a tablet	How will learning technology benefit you?	Practice the learned tablet functions and explore it Looking up songs and taking pics!
<u>Week 3</u> (06/23/25) (06/24/25)	Setting up and using email via Google	What are the functions of an email address?	Send 3 emails to 3 other peers in the class and 1 to the instructor
<u>Week 4</u> (06/30/25) (07/01/25)	Cybersecurity: Avoiding Scams & Fraud	Scam or real? exercise	Complete worksheet on cybersecurity - True/False Statements
<u>Week 5</u> (07/07/25) (07/08/25)	Looking up online information	Asking google questions	Do some online research on a topic of your choice
<u>Week 6</u> (07/14/25) (07/15/25)	Installing and using apps - Practicing with Duolingo	Which apps does your tablet have?	Use 3 of the apps on your tablet Play Duolingo

<u>Week 7</u> (07/21/25) (07/22/25)	Staying connected: Communicating with others	How will you chat with others online?	Zoom call with a friend or family member!
<u>Week 8</u> (07/28/25) (07/29/25)	Online Shopping, Transportation, and Banking	Amazon order activity	Fill-in the blank: Steps for accessing/using the uber app
<u>Week 9</u> (08/04/25) (08/05/25)	Health & Resources: Accessing benefit portals	Which benefit portals will you use?	Find a benefit portal and assess its use
<u>Week 10</u> (08/11/25) (08/12/25)	Online entertainment and learning: Free courses, content, and materials	What would you like to learn online?	Find a free online resource to help you learn a new chosen skill
<u>Week 11</u> (08/18/25) (08/19/25)	Other technologies	Which new technology would you want to use?	Describe what the perfect technological device would be like
<u>Week 12</u> (08/25/25) (08/26/25)	Balancing a healthy use of technology	How will you spend your time using technology?	Continue to use your tablet and enjoy what you have learned in the class! 

Appendix C

Motivation Session - TELACU Learning Program - Syllabus

Location and times

TELACU Las Fuentes - Community Room in the 1st Floor

Instructor(s):

Tania M. Rodriguez, MA

- Email: trodr020@ucr.edu

Description

While you enjoy a free lunch and snacks, motivation/discussion sessions will occur for 50 minutes every week, for 12 weeks, during the learning program. Aside from learning the skills of English and technology, we will engage in lectures and discussions related to motivations, barriers, and experiences for learning new skills during older adulthood. We will also talk about aging myths, stereotypes, theories, and how to achieve positive aging outcomes. Overall, the discussions are designed to help you develop strategies to maximize your motivation for lifelong learning and aging healthily.

Schedule of Topics Covered Each Week

Week	Topics	Activity
Week 0	Syllabus overview	Write down 3 specific goals you wish to accomplish in the learning program.
Week 1	Course introduction, aims & expectations, importance of lifelong learning	<u>Reflection on learning</u> : How is lifelong learning important and beneficial?
Week 2	Learning across the lifespan: Learning as a child versus as an	<u>Reflection on learning</u> : How has your learning changed?

	older adult	
Week 3	Age stereotypes, myths, and neuroplasticity	<u>Reflection on stereotypes:</u> True or false activity.
Week 4	Motivation, growth mindset, and serious commitment to learning	<u>Reflection on motivation:</u> What motivates you to learn?
Week 5	Understanding and combating barriers to learning engagement	<u>Reflection on barriers:</u> What are your learning barriers (if any)?
Week 6	Theories of healthy aging	<u>Reflection on aging:</u> What does aging well mean to you?
Week 7	Strategies for aging well: Cognition & Cognitive engagement	<u>Reflection on healthy aging:</u> How can you improve your cognitive function?
Week 8	Strategies for aging well: Healthy eating habits	<u>Reflection on healthy aging:</u> How can you improve your eating habits?
Week 9	Strategies for aging well: Exercise	<u>Reflection on healthy aging:</u> How can you improve your physical health through exercise?
Week 10	Autonomy and functional independence	<u>Reflection on autonomy:</u> How will the skills you are learning help you be more independent?
Week 11	Catching-up!	Addressing remaining questions!
Week 12	Wrapping-up, evaluating the learning program, and planning your future learning journey	<u>Reflection on future learning:</u> How will you look for and find more learning opportunities?

Appendix D

Quantitative Measures Survey

Instrumental Activities of Daily Living (IADL)

Script: For the following, please choose the description that most closely resembles your highest level of usage for each category:”

Ability to Use Telephone

1. Operates telephone on own initiative-looks up and dials numbers, etc.....1
2. Dials a few well-known numbers.....1
3. Answers telephone but does not dial.....1
4. Does not use telephone at all.....0

- 9 = Prefer not to answer

Shopping

1. Takes care of all shopping needs independently.....1
2. Shops independently for small purchases.....0
3. Needs to be accompanied on any shopping trip.....0
4. Completely unable to shop.....0

- 9 = Prefer not to answer

Food Preparation

1. Plans, prepares and serves adequate meals independently.....1
2. Prepares adequate meals if supplied with ingredients.....0

3. Heats, serves and prepares meals, or prepares meals, or prepares meals but does not maintain adequate diet.....0

4. Needs to have meals prepared and served.....0

- 9 = Prefer not to answer

Housekeeping

1. Maintains house alone or with occasional assistance (e.g. "heavy work domestic help").....1

2. Performs light daily tasks such as dish washing, bed making.....1

3. Performs light daily tasks but cannot maintain acceptable level of cleanliness.....1

4. Needs help with all home maintenance tasks.....1

5. Does not participate in any housekeeping tasks.....0

- 9 = Prefer not to answer

Laundry

1. Does personal laundry completely.....1

2. Launders small items-rinses stockings, etc.....1

3. All laundry must be done by others.....0

- 9 = Prefer not to answer

Mode of Transportation

1. Travels independently on public transportation or drives own car.....1

2. Arranges own travel via taxi, but does not otherwise use public transportation.....1
3. Travels on public transportation when accompanied by another.....1
4. Travel limited to taxi or automobile with assistance of another.....0
5. Does not travel at all.....0

- 9 = Prefer not to answer

Responsibility for Own Medications

1. Is responsible for taking medication in correct dosages at correct time.....1
2. Takes responsibility if medication is prepared in advance in separate dosage.....0
3. Is not capable of dispensing own medication.....0

- 9 = Prefer not to answer

Ability to Handle Finances

1. Manages financial matters independently (budgets, writes checks, pays rent, bills, goes to bank), collects and keeps track of income.....1
2. Manages day-to-day purchases, but needs help with banking, major purchases, etc.....1
3. Incapable of handling money.....0

- 9 = Prefer not to answer

Reference: Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist*, 19(3), 179–186. https://doi.org/10.1093/geront/9.3_Part_1.179

IADL (For Online Activities)

Script: For the following, please choose the description that most closely resembles your highest level of usage for each category (if you don't use online services for any of the following, just let me know whether you feel confident in doing the activity if you were asked to do it without any instructions/guidance):

Online Shopping (grocery and/or household items)

1. Takes care of all shopping needs online independently.....1
2. Shops independently for small purchases1
3. Needs to be assisted with any online shopping0
4. Completely unable to shop online0

- 9 = Prefer not to answer

Booking Transportation (i.e., shuttle services, ride-share apps, taxi services, etc.):

1. Books travel arrangements independently using an online portal/application/website.....1
2. Arranges online travel with assistance.....1
3. Does not book online transportation at all0

- 9 = Prefer not to answer

Online Medical Needs (i.e., refilling prescriptions, booking appointments, attending telehealth appointments, etc.):

1. Can attend to all medical needs online without assistance.....1
2. Needs some assistance getting started, but can complete task after initial support.....1
3. Is not capable of completely medical needs task online.....0

- 9 = Prefer not to answer

Online Banking/Finances:

1. Manages financial matters independently (budgets, writes checks, pays rent and bills, uses online bank); collects and keeps track of income entirely online.....1
2. Can review banking or finances online with some assistance.....0
3. Incapable of using online banking or financing tools.....0

- 9 = Prefer not to answer

Reference: *Adapted from:* Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist*, 19(3), 179–186. https://doi.org/10.1093/geront/9.3_Part_1.179.

Intrinsic Motivation to Learn Scale (IMLS)

1. Learning new skills is fulfilling to me.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Strongly	Disagree	Somewhat	Neither	Somewhat	Agree	Strongl
Disagree		disagree	Agree nor	Agree		y Agree
			disagree			

2. Developing my understanding of new skills is rewarding to me.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Strongly	Disagree	Somewhat	Neither	Somewhat	Agree	Strongly
Disagree		disagree	Agree nor	Agree		Agree
			disagree			

3. Learning new skills makes me feel better about myself.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Strongly	Disagree	Somewhat	Neither	Somewhat	Agree	Strongly
Disagree		disagree	Agree nor	Agree		Agree
			disagree			

4. Learning new skills is enjoyable to me.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Strongly	Disagree	Somewhat	Neither	Somewhat	Agree	Strongly
Disagree		disagree	Agree nor	Agree		Agree
			disagree			

5. It is personally satisfying for me to learn new skills.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Strongly	Disagree	Somewhat	Neither	Somewhat	Agree	Strongly
Disagree		disagree	Agree nor	Agree		Agree
			disagree			

6. I get a sense of fulfillment when I learn new skills

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Strongly	Disagree	Somewhat	Neither	Somewhat	Agree	Strongly
Disagree		disagree	Agree nor	Agree		Agree
			disagree			

7. Learning new skills in this class makes me feel like I am growing as a person.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Strongly	Disagree	Somewhat	Neither	Somewhat	Agree	Strongly
Disagree		disagree	Agree nor	Agree		Agree
			disagree			

8. I desire to learn new skills because it gives me a sense of fulfillment.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat disagree	Neither Agree nor disagree	Somewhat Agree	Agree	Strongly Agree

Reference: Goldman, Z. W., Goodboy, A. K., & Weber, K. (2017). College students' psychological needs and intrinsic motivation to learn: An examination of self-determination theory. *Communication Quarterly*, 65(2), 167-191.
<https://doi.org/10.1080/01463373.2016.1215338>

(Reverse coded items removed)

The PERMA

Script: For the following statements, please select the rating that best represents your experience with each of the described events.

1. How much of the time do you feel you are making progress towards accomplishing your goals?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

2. How often do you become absorbed in what you are doing?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

3. In general, how often do you feel joyful?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

4. *In general, how often do you feel anxious?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

5. How often do you achieve the important goals you have set for yourself?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

6. In general, how would you say your health is?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Terrible	Very bad	Bad	Average	Good	Very	Excellent
					good	

7. In general, to what extent do you lead a purposeful and meaningful life?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	
	extent				extent	

8. To what extent do you receive help and support from others when you need it?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	
	extent				extent	

9. In general, to what extent do you feel that what you do in your life is valuable and worthwhile?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	
	extent				extent	

10. In general, to what extent do you feel excited and interested in things?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	
	extent				extent	

11. *How lonely do you feel in your daily life?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	

small	extent	extent	large
extent			extent

12. How satisfied are you with your current physical health?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	
	extent				extent	

13. In general, how often do you feel positive?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

14. *In general, how often do you feel angry?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

15. How often are you able to handle your responsibilities?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

16. *In general, how often do you feel sad?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

17. How often do you lose track of time while doing something you enjoy?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Never	Rarely	Occasionally	Sometimes	Somewhat	Often	Very
				often		Often or
						always

18. Compared to others of your same age and sex, how is your health?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Terrible	Very bad	Bad	Average	Good	Very	Excellent
					good	

19. To what extent do you feel loved?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	

extent

extent

20. To what extent do you generally feel you have a sense of direction in your life?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	
	extent				extent	

21. How satisfied are you with your personal relationships?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	
	extent				extent	

22. In general, to what extent do you feel content?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	
	extent				extent	

23. Taking all things together, how happy would you say you are?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Not at	To a	To a small	To a	To a	To a	Completely
all	very	extent	moderate	large	very	
	small		extent	extent	large	
	extent				extent	

Reference: Butler, J., & Kern, M. L. (2016). The PERMA-Profler: A brief multidimensional measure of flourishing. *International Journal of Wellbeing*, 6(3), 1-48.
<https://doi.org/10.5502/ijw.v6i3.1>

*Reverse coding

Adult Learning Self-Efficacy Scale (ALSE)

Script: On a scale from 1 (Not confident at all) to 7 (Extremely confident), how confident are you that you can...

1. Make enough time in your schedule to do assignments

○ 9 = Prefer not to answer

1 2 3 4 5 6 7

Not Not very Slightly Moderately Confident Very Extremely
confident confident confident confident confident confident
at all

2. Do well in the learning program and maintain a healthy lifestyle

○ 9 = Prefer not to answer

1 2 3 4 5 6 7

Not Not very Slightly Moderately Confident Very Extremely
confident confident confident confident confident confident
at all

3. Modify your schedule to complete work related to the learning program

○ 9 = Prefer not to answer

1 2 3 4 5 6 7

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

4. Take classes at the right difficulty level given other responsibilities

○ 9 = Prefer not to answer

1 2 3 4 5 6 7

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

5. Do well in this program and keep up your social life

○ 9 = Prefer not to answer

1 2 3 4 5 6 7

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

6. Effectively divide time between the learning program and other responsibilities

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

7. Catch up on your work related to the learning program if you fall behind

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

8. Do well in this program and keep up your family obligations

○ 9 = Prefer not to answer

1 2 3 4 5 6 7

Not Not very Slightly Moderately Confident Very Extremely
confident confident confident confident confident confident
at all

9. Do well both at work (or do well with your current responsibilities) and in the
learning program

○ 9 = Prefer not to answer

1 2 3 4 5 6 7

Not Not very Slightly Moderately Confident Very Extremely
confident confident confident confident confident confident
at all

10. Avoid mind wandering while studying

○ 9 = Prefer not to answer

1 2 3 4 5 6 7

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

11. Stay focused on what is to be learned or done

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

12. Think about a problem in a different way if you are having trouble

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

13. Avoid distractions while studying

- 9 = Prefer not to answer

1 2 3 4 5 6 7

Not Not very Slightly Moderately Confident Very Extremely
confident confident confident confident confident confident
at all

14. Remember new skill-related procedures after only a little practice

- 9 = Prefer not to answer

1 2 3 4 5 6 7

Not Not very Slightly Moderately Confident Very Extremely
confident confident confident confident confident confident
at all

15. Remember information presented in class

- 9 = Prefer not to answer

1 2 3 4 5 6 7

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

16. Have the cognitive ability to solve most homework problems

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

17. Learn new concepts quickly

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Not	Not very	Slightly	Moderately	Confident	Very	Extremely
confident	confident	confident	confident		confident	confident
at all						

18.

Reference: Lyndgaard, S. F., Tatel, C. E., Pham, V., Melkers, J. E., & Kanfer, R. (2024). Towards a multidimensional measure of self-efficacy in the adult learning ecosystem. *International Journal of Lifelong Education*, 43(6), 579-602.
<https://doi.org/10.1080/02601370.2024.2369895>

12-item Expectations Regarding Aging

Script: The following questions are about what you expect regarding aging, please select the extent to which you believe each statement is true in accordance to how you feel about it.

1. When people get older, they need to lower their expectations of how healthy they can be.

○ 9 = Prefer not to answer

1 2 3 4 5 6 7

Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

2. The human body is like a car: When it gets old, it gets worn out.

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

3. Having more aches and pains is an accepted part of aging.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

4. Every year that people age, their energy levels go down a little more.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely

True	True	True	False	False
-------------	-------------	-------------	--------------	--------------

5. I expect that as I get older I will spend less time with friends and family.

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

6. Being lonely is just something that happens when people get old.

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

7. As people get older, they worry more.

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

8. It's normal to be depressed when you are old.

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

9. I expect that as I get older I will become more forgetful.

○ 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

10. It's an accepted part of aging to have trouble remembering names.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

11. Forgetfulness is a natural occurrence just from growing old.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely

True	True	True	False	False
-------------	-------------	-------------	--------------	--------------

12. It is impossible to escape the mental slowness that happens with aging.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Definitely	True	Somewhat	Sometimes	Somewhat	False	Definitely
True		True	True	False		False

Reference: Sarkisian, C. A., Steers, W. N., Hays, R. D., & Mangione, C. M. (2005). Development of the 12-item expectations regarding aging survey. *The Gerontologist*, 45(2), 240-248. <https://doi.org/10.1093/geront/45.2.240>

Appendix E

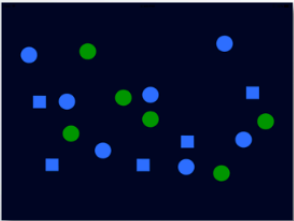
TabCAT

Available in Spanish, Cantonese, Mandarin

Types of assessments within TabCAT:

- Cognitive control:
 - a. NIH Examiner - Flanker
 - b. NIH Examiner - Set Shifting
- Working Memory:
 - c. NIH Examiner - Dot Counting
 - d. Running Dots (similar to NIH Examiner N-back task)

Task Descriptions	Dot Counting
<u>Executive/Speed: Dot Counting</u>	
• Summary: This task measures working memory skills and is modeled after NIH EXAMINER Dot Counting. • Description: • The patient is asked to look at a screen with a mixed array of green circles, blue circles and blue squares. The patient is asked to count all of the blue circles on the screen one at a time, out loud and remember the final total. Once the patient finishes counting the blue circles on one screen, the examiner switches the display to a different mixed array of green circles, blue circles and blue squares. The patient is instructed to count the blue circles in the new display.	

Task Descriptions	Dot Counting (continued)
• Description (continued) • The number of different displays presented to the examinee in each trial increases from two to seven over six experimental trials. After counting the blue circles on all of the displays presented within a trial, the patient is asked to recall the total number of blue circles that were counted in each of the different displays in the order in which they were presented. Partial credit is given based on how many totals the patient can recall correctly from each trial. • Test Time Duration: 3 minutes	
 	

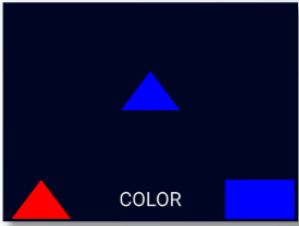
Task Descriptions	Flanker
<u>Executive/Speed: Flanker</u> • Summary: This task measures inhibition skills and is modeled after NIH EXAMINER Flanker. • Description: • A row of five arrows is presented in the center of the screen. The patient is required to indicate whether the centrally presented arrow is pointing either to the left or right by pressing the left or right arrow key. • The patient is presented with two different conditions during the task, incongruent and congruent. In the congruent trials, the non-target arrows point in the same direction as the target arrow and in the incongruent trials they point in the opposite direction. • Patients should respond as quickly and accurately as possible. • Test Time Duration: 6 – 8 minutes	
	

Task Descriptions

Set Shifting

Executive/Speed: Set Shifting

- **Summary:** This task measures set shifting skills and is modeled after NIH EXAMINER Set Shifting.
- **Description:**
 - Patients are required to match a stimulus on the top of the screen to one of two stimuli in the lower corners of the screen.
 - In task-homogeneous blocks, patients perform either Task A (e.g., classifying shapes) or Task B (e.g., classifying colors). In task-heterogeneous blocks, patients alternate between the two tasks pseudo-randomly.
 - The combination of task-homogeneous and task-heterogeneous blocks allows measurement of general switch costs (latency differences between heterogeneous and homogeneous blocks) and specific switch costs (differences between switch and non-switch trials within the heterogeneous block).
- **Test Time Duration (min):** 6-8



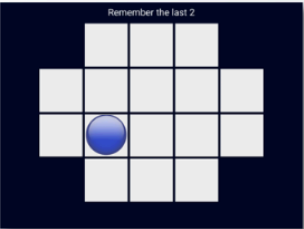


Task Descriptions

Running Dots

Executive/Speed: Running Dots

- **Summary:** This task measures spatial working memory. Patients watch a series of dots appear and disappear from a screen one by one, then recall the last 2 – 5 locations where a dot appeared, depending on the condition.
- **Description:** In each trial of this task, dots are displayed to the patient (one by one) in various locations on a 16-square grid. 1-6 leading dots precede each set of “target dots” that the patient is instructed to remember (ex. “remember the location of the last two dots you see”). There are 5 trials for each condition, presented in random order without replacement, such that each subject receives all the same trials across the full testing period, but in differing orders. Partial credit is given for each dot location correctly identified.
- **Test Time Duration:** 8 – 10 minutes





Appendix F

BTACT

Word List Recall (1.5 minutes on average)

I am going to read a list of 15 words. Listen carefully. When I am finished, you are to repeat as many of the words as you can remember. It doesn't matter in what order you repeat them. Just try to remember as many as you can. I will say each word only one time, and I cannot repeat any words. You will have up to one and a half minutes, and I will not say anything until I tell you that your time is up. Do you have any questions? Are you ready?

If person stops before 1 minute is up, say, "there is still more time can you think of any more"

List of Words	Tally Mark the number of times a word is repeated & Mark for any intrusion								Total # of Repetition of Word
Drum									
Curtain									
Bell									
Coffee									
School									
Parent									
Moon									
Garden									
Hat									
Farmer									
Nose									
Turkey									
Color									
House									
River									
Intrusions									

Total # Repetitions: _____	Total # Intrusions: _____	Total # Unique Items: _____
----------------------------	---------------------------	-----------------------------

Digits Backward (2.5 minutes on average)

I am going to say some strings of numbers, and when I am done I would like you to repeat them backwards, in the reverse order from which I said them. So if I said "3, 8", you would say "8, 3". Do you understand? The sets will get larger as we go.

Level	Strings of Numbers <i>If they get (a) correct, move on to the next level. Discontinue if (a) and (b) are missed on a level.</i>	Participant's response of the number sequence
1	a. 2 – 4 (4 – 2) b. 5 – 7 (7 – 5)	a. b.
2	a. 6 – 2 – 9 (9 – 2 – 6) b. 4 – 1 – 5 (5 – 1 – 4)	a. b.
3	a. 3 – 2 – 7 – 9 (9 – 7 – 2 – 3) b. 4 – 9 – 6 – 8 (8 – 6 – 9 – 4)	a. b.
4	a. 1 – 5 – 2 – 8 – 6 (6 – 8 – 2 – 5 – 1) b. 6 – 1 – 8 – 4 – 3 (3 – 4 – 8 – 1 – 6)	a. b.
5	a. 5 – 3 – 9 – 4 – 1 – 8 (8 – 1 – 4 – 9 – 3 – 5) b. 7 – 2 – 4 – 8 – 5 – 6 (6 – 5 – 8 – 4 – 2 – 7)	a. b.
6	a. 8 – 1 – 2 – 9 – 3 – 6 – 5 (5 – 6 – 3 – 9 – 2 – 1 – 8) b. 4 – 7 – 3 – 9 – 1 – 2 – 8 (8 – 2 – 1 – 9 – 3 – 7 – 4)	a. b.

7	a. 9-4-3-7-6-2-5-8 (8-5-2-6-7-3-4-9) b. 7-2-8-1-9-6-5-3 (3-5-6-9-1-8-2-7)	a. b.
---	--	--------------

Category Fluency (1.5 minutes on average)

Now I am going to give you a category and you will name things that belong in that category. Let's practice with the category "fruit". You could say peach, or pear. Can you think of any other fruits? (wait for 2 correct items). In a moment I will give you another category. When I say begin, you will name all the things from this new category you can think, as fast as you can. You will have one minute to do this. I will let you know when your time is up. The new category is animals. Do you have any questions? Ready?

1 – 15 sec.

15 – 30 sec.

30 – 45 sec.

45 – 60 sec.

Total # Repetitions: _____	Total # Intrusions: _____	Total # Unique Items: _____
----------------------------	---------------------------	-----------------------------

Red/Green Test (3-3.5 minutes on average)

Next I am going to see how quickly you can respond to the words RED and GREEN. Every time I say RED you will say STOP, and every time I say GREEN you will say GO. Try to be accurate, but respond as quickly as you can. So when I say RED you will say...

And when I say GREEN you will say...

Do you have any questions? Let's begin. This will last about 1 minute.

- Highlight the response box for the trials that the participant gets correct without self-correction.

Trial		Highlight participant's response	Score (1 for correct, 0 for incorrect or self-correction, 2 for invalid trials)
1	GREEN	GO / STOP	
2	RED	STOP / GO	
3	GREEN	GO / STOP	
4	RED	STOP / GO	
5	RED	STOP / GO	
6	GREEN	GO / STOP	
7	RED	STOP / GO	
8	GREEN	GO / STOP	
9	RED	STOP / GO	
10	GREEN	GO / STOP	
11	RED	STOP / GO	
12	GREEN	GO / STOP	
13	GREEN	GO / STOP	
14	RED	STOP / GO	
15	RED	STOP / GO	
16	GREEN	GO / STOP	
17	RED	STOP / GO	
18	GREEN	GO / STOP	
19	GREEN	GO / STOP	
20	RED	STOP / GO	
			Total Score:

Now you will do just the reverse of what you have been doing. So when you hear RED you will say GO, and when you hear GREEN you will say STOP. Do you have any questions? When I say RED you will say... and when I say GREEN you will say... Try to be accurate, but answer as quickly as you can.

- Highlight the response box for the trials that the participant gets correct without self-correction

Trial		Highlight participant's response	Score (1 for correct, 0 for incorrect or self-correction, 2 for invalid trials)
1	GREEN	STOP / GO	
2	RED	GO / STOP	
3	GREEN	STOP / GO	
4	RED	GO / STOP	
5	RED	GO / STOP	
6	GREEN	STOP / GO	
7	RED	GO / STOP	
8	GREEN	STOP / GO	
9	RED	GO / STOP	
10	GREEN	STOP / GO	
11	RED	GO / STOP	
12	GREEN	STOP / GO	
13	GREEN	STOP / GO	
14	RED	GO / STOP	
15	RED	GO / STOP	
16	GREEN	STOP / GO	
17	RED	GO / STOP	
18	GREEN	STOP / GO	
19	GREEN	STOP / GO	
20	RED	GO / STOP	
			Total Score:

Now we are going to mix up these two types of responses. When I give the cue *NORMAL*, you will respond the way you did at first: red means stop, green means go. But when I say *REVERSE*, you will give the reverse responses: *RED* means *GO*, *GREEN* means *STOP*. We will alternate between the *NORMAL* and the *REVERSE* every few trials. Let's try a few for practice.

NORMAL	RED	STOP
	GREEN	GO
	RED	STOP
REVERSE	GREEN	STOP
	RED	GO
	RED	GO
NORMAL	GREEN	GO
	RED	STOP
	GREEN	GO
REVERSE	GREEN	STOP
	RED	GO

Do you have any questions? . Try to be accurate, but answer as quickly as you can. This will take about one minute.

- Highlight the response box for the trials that the participant gets correct

Trial			Highlight participant's response	Correct, Incorrect, or Invalid
1	NORMAL	GREEN	GO / STOP	
2		RED	STOP / GO	
3		GREEN	GO / STOP	
4	REVERSE	RED	GO / STOP	
5		RED	GO / STOP	
6		GREEN	STOP / GO	
7		RED	GO / STOP	
8		RED	GO / STOP	
9	NORMAL	RED	STOP / GO	
10		GREEN	GO / STOP	
11		RED	STOP / GO	
12		GREEN	GO / STOP	
13		GREEN	GO / STOP	
14		RED	STOP / GO	
15	REVERSE	GREEN	STOP / GO	
16		GREEN	STOP / GO	
17		RED	GO / STOP	
18		GREEN	STOP / GO	
19	NORMAL	GREEN	GO / STOP	

20		RED	STOP / GO	
21		GREEN	GO / STOP	
22		GREEN	GO / STOP	
23		RED	STOP / GO	
24	REVERSE	GREEN	STOP / GO	
25		GREEN	STOP / GO	
26		RED	GO / STOP	
27		GREEN	STOP / GO	
28		RED	GO / STOP	
29	NORMAL	RED	STOP / GO	
30		GREEN	GO / STOP	
31		RED	STOP / GO	
32		GREEN	GO / STOP	
				Total Score:

Number Series (2.5 minutes)

In the next exercise I will read you a series of numbers that may get larger or smaller in value. At the end you will try to figure out what the next number would be. So if the numbers were 2,4,6,8,10, the next number would be 12. After I say each number I will pause for as long as you need, and then you should say "okay" when you are ready for me to go on to the next number in the group. So if I said 2, you should say "okay" when you are ready for me to go on to the next number, then I say 4, you say okay, 6, okay, 8, okay, 10, and at the end I will ask you what you think the next number would be. In this case the next number would be 12, as each number has increased by 2.

Let's try one for practice: 35 (okay), 30 (okay), 25 (okay), 20 (okay), 15 (okay) AND the next number would be....???? (The answer should be 10 as each number has decreased by 5). There will be different patterns, and some of these will be harder than others, so just do the best you can. If you are not sure of the answer, it is okay to guess. Do you have any questions? (Pause after each of the first 4 items for okay response; after the last item, say AND the next number is...?).

Number Series	Participant's response	Correct? (Y/N)
1. 18, 20, 24, 30, 38..... (48)		
2. 81, 78, 75, 72, 69..... (66)		
3. 7, 12, 16, 19, 21..... (22)		
4. 28, 25, 21, 16, 10..... (3)		
5. 20, 37, 18, 38, 16..... (39)		
		Total Correct:

Backward Counting (45 seconds)

Next, I would like to see how fast you can count backwards. When I give the signal to begin, start counting backwards from 100 out loud, as fast as you can. So you will say 100, 99, 98 and so on. You will have half a minute. Do you have any questions? I will let you know when the time is up. Begin (Time for 30 seconds) and note the number of errors during backward counting.

A. Number of Errors (for every error, draw a tally mark in the box below)

B. Final Number Reached: _____

Total Number Counted Correctly: $100 - (\mathbf{A+B}) =$ _____

Short-Delay Word Call (40 seconds on average)

Do you remember the very first list of 15 words that I read to you in the beginning? It was the very first thing we did. (WAIT FOR SUBJECT TO RESPOND YES. MAKE SURE THEY UNDERSTAND THAT IT IS THE WORD LIST, NOT THE CATEGORY FLUENCY TEST). I want you to tell me as many of the words from that list as you can. You will have up to one minute. I will tell you when your time is up. (Record words recalled, including intrusions and repetitions.) If person stops before 1 minute is up, say, "there is still more time can you think of anymore"

List of Words	Tally Mark the number of times a word is repeated & Mark for any intrusion								Total # of Repetition of Word
Drum									
Curtain									
Bell									
Coffee									
School									
Parent									
Moon									
Garden									
Hat									
Farmer									
Nose									
Turkey									
Color									
House									
River									
Intrusions									

Total # Repetitions: _____	Total # Intrusions: _____	Total # Unique Items: _____
----------------------------	---------------------------	-----------------------------

Appendix G

Post-Intervention Interview Protocol

Script: “For this part of the assessments, we will conduct an interview that will be audio recorded. No one else will be able to hear this recording besides our research team and the audio files will be safely stored, so feel free to share your thoughts, feelings, and experiences with total honesty. This interview is only to obtain a greater understanding of your experience in the learning program. Do you have any questions about this before we begin the interview?”

If there are no questions, proceed to record and inform participant once you have begun recording:

1. **When you press record say the following:**

“This is is __[interviewer name]__, Participant ID __[#####]__, the date is __##/##/##__, *Post Interview*, TELACU Intervention

Introductory script: “As I priorly mentioned, the following questions are about your thoughts and experiences in the learning program. If you don’t feel comfortable answering any of the questions, please let me know and I can skip them over. Some of the questions might evoke certain emotions, as such, if at any point you feel you need a break from the interview, we can do that, just let me know. Ready?”

Qualitative Interview Questions:

- 1) Do you think that engaging in learning new skills is important in older adulthood?
 - **Follow-up:** Why do you think that?

- 2) Since the start of the learning program, have you begun learning any other skills besides English and technology?
- **If participant says yes, ask:** What are those skills and why are you learning them?
- 3) Since the start of the learning program until now, do you feel that your motivation to learn new skills in general has increased, stayed the same, or decreased?
- **Follow-up:** Why do you think that your motivation has [*insert participant's response*]?
 - **If participant says their motivation has decreased, ask:** What do you think would help you become more motivated to learn new skills?
- 4) How would you describe your experience in the learning program overall?
- **Follow-up:** What did you like the most about the program overall?
 - **Follow-up:** What did you like the least about the program overall?
- 5) Were your initial expectations of the learning program met?
- **If participant says yes, ask:** In what ways did the learning program meet your initial expectations (whether positively or negatively)?
 - **If participant says no, ask:** Why not? What expectations did you have that were not met (whether positive or negative)?
- 6) What things from the learning program were the most challenging or difficult for you (if any)?
- **Follow-up:** What barriers or impediments to your engagement in learning the skills offered did you face (if any)?

- 7) What did you enjoy the most about the learning program (if anything)?
- 8) What are things that facilitated your participation in learning the skills offered (if any)?
- **If participants need further prompting, ask:** What things helped you to be able to participate in the learning program?
 - **Follow-up:** What are some strengths or positive things within this community that you are a part of that helped or supported you to participate in the learning program?
 - *[if participant is confused about what community we are referring to, just specify that by community, we mean their residential facility, staff, and other residents or participants in the program:*
 “When we say community, we are referring to this residential facility, TELACU Las Fuentes, including other residents, the staff, and other people that are a part of this place and the other participants within the learning program.”]
- 9) Which of the two skills that you learned (English and technology) was the most challenging and which one was the easiest to learn?
- **Follow-up:** Why?
- 10) Which of the two skills that you learned (English and technology) did you find to be most enjoyable and which one did you find to be the least enjoyable?
- **Follow-up:** Why?

11) Is there anything about the learning program that you would have changed? If so, what things and for what purpose?

12) Do you think that your participation in the learning program has benefited you in any way?

- **If participant says yes, ask:** Could you describe what those benefits are?
- **If participant says no, ask:** Why do you think that you have not benefited from participating in the learning program?

13) Do you believe that you actually learned English and technology?

- **If participant says yes, ask:** How so?
- **If participant says no, ask:** Why do you think you did not actually learn?

14) Have you applied the skills that you have learned (English and technology) to your daily life in any way?

- **If participants need further prompting, ask:** Can you think of ways in which you have used the skills you learned in the program (English and technology) in your life?
- **If participant says yes, ask:** How so?
- **If participant says no, ask:** Why not?

15) Did you feel supported by others to learn in the learning program?

- **If participant says yes, ask:** How so and by whom?
- **If participant says no, ask:** Why do you think that you were not being supported and who would you have liked to show you more support?

16) Do you plan to continue learning English and technology to eventually master each of them?

- **If participant says yes, ask:** Why and how will you continue learning these skills?
- **If participant says yes, ask:** Why not?

17) Are you interested in learning any other new skills?

- **If participant says yes, ask:**
 - What new skills are you interested in learning and why?
 - Do you plan on seeking new learning opportunities to learn these other new skills?
 - **If participant says yes, ask:** Where do you plan to seek these learning opportunities?
- **If participant says no, ask:** Why are you not interested in learning any other new skills?

18) If there was another opportunity to participate in a learning program like the one you just participated in, would you participate?

- **If participant says yes, ask:** Why?
- **If participant says no, ask:** Why not?

Now, to finish off the interview, the following set of questions will ask about your perceptions/views regarding your mental abilities, functional independence, and well-being. I am going to ask you to rate yourself on certain things using a scale from 1

to 10, 1 being a low score and 10 representing a high score, and then to explain your reasoning for each rating.

19) From 1-10, how do you rate your mental ability or capacity (when we say mental ability or capacity we are referring to your brain's ability to remember, focus, pay attention, speed of thinking and other things that we use our brain and mind for)?

- **Follow-up#1:** Now, describe with words why you gave yourself the rating you did.
- **Follow-up#2:** Do you think that the learning program has had any impact (whether positive or negative) on your **mental abilities** (e.g., memory)?
 - Why do you think that?

20) From 1-10, how independent are you in communicating and understanding English?

- **Follow-up#1:** Now, describe with words why you gave yourself the rating you did.
- **Follow-up#2:** Do you think that the learning program has had any impact (whether positive or negative) on your **independence for communicating and understanding English**?
 - Why do you think that?

21) From 1-10, how independent are you in using a tablet and technology?

- **Follow-up#1:** Now, describe with words why you gave yourself the rating you did.

- **Follow-up#2:** Do you think that the learning program has had any impact (whether positive or negative) on your **independence for navigating a tablet and technology**?
 - Why do you think that?

22) From 1-10, how happy are you in life?

- **Follow-up#1:** Now, describe with words why you gave yourself the rating you did.
- **Follow-up#2:** Do you think that the learning program has had any impact (whether positive or negative) on your **happiness**?
 - Why do you think that?

23) From 1-10, how is your physical health currently?

- **Follow-up#1:** Now, describe with words why you gave yourself the rating you did.
- **Follow-up#2:** Do you feel that the learning program has had any impact (whether positive or negative) on your **physical health**?
 - Why do you think that?

24) From 1-10, how is your mental health currently?

- **Follow-up#1:** Now, describe with words why you gave yourself the rating you did.
- **Follow-up#2:** Do you think that the learning program has had any impact (whether positive or negative) on your **mental health**?
 - Why do you think that?

25) From 1-10, how satisfied are you with life?

- **Follow-up#1:** Now, describe with words why you gave yourself the rating you did.
- **Follow-up#2:** Do you think that the learning program has had any impact (whether positive or negative) on your **satisfaction with life**?
 - Why do you think that?

26) Is there anything else you would like to share with us that we have not discussed in this interview? If so, please feel free to share any additional comments, thoughts, or experiences that you think are important and relevant to the interview.

Appendix H

Tracking Weekly Level of Engagement Sheet

ENGLISH CLASS

This packet is meant to be carried by the researcher sitting in and observing each class to take notes on the level of engagement from the participants, including attendance. Please make note of any time someone asks questions, participates in any group activities, etc.

Class Session Time: _____

Participant group: Chinese /

Spanish

Week: _____

Date: _____

Level of Engagement (English class)

Name: _____

- Did they attend class today on time?
 - Yes
 - No

Notes: _____

-
- Did they complete their homework?

- Yes
- No

Number of hours spent on HW: _____

Notes

: _____

-
- Did they leave class earlier than the ending time?

- Yes, they left earlier
- No, they stayed the entire class time

Notes: _____

- Did they engage in most of the activities assigned by the instructor?

- Yes
- No

Notes: _____

- Did they look attentive to the instructor?
 - Yes
 - No

Notes: _____

- Please use a check mark for each time the student asks a question to instructor:

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Additional Notes:

Tracking Weekly Level of Engagement Sheet

TECHNOLOGY CLASS

This packet is meant to be carried by the researcher sitting in and observing each class to take notes on the level of engagement from the participants, including attendance. Please make note of any time someone asks questions, participates in any group activities, etc.

Class Session Time: _____

Participant group: Chinese /

Spanish

Week: _____

Date: _____

Level of Engagement (Tech class)

Name: _____

- Did they attend class today on time?
 - Yes
 - No

Notes: _____

- Did they complete their homework?

- Yes

- No

Number of hours spent on HW: _____

Notes

: _____

- Did they leave class earlier than the ending time?

- Yes, they left earlier

- No, they stayed the entire class time

Notes: _____

- Did they engage in most of the activities assigned by the instructor?
 - Yes
 - No

Notes: _____

- Did they look attentive to the instructor?
 - Yes
 - No

Notes: _____

- Please use a check mark for each time the student asks a question to instructor:

--	--	--	--	--	--	--	--	--	--	--	--	--	--

Additional Notes:

Appendix I

Demographics Survey

Script: This set of questions are meant to ask you about your demographics in general.

Please let me know if you would like to skip any questions that you don't feel comfortable answering and we can skip them without a problem.

- 1) Please state your Date of Birth (MM/DD/YY)

Opened ended: ____/____/____

- 9 = Prefer not to answer

- 2) Please enter your age

Open ended: _____

- 9 = Prefer not to answer

- 3) What is your gender?

- 1 = Male
- 2 = Female
- 3 = Other: _____
- 9 = Prefer not to answer

- 4) Were you born in the U.S?

- 1 = Yes
- 2 = No
- 9 = Prefer not to answer

- 5) If you were not born in the U.S., where were you born?

Open ended: _____

- 9 = Prefer not to answer/ not applicable

6) If you were born outside of the U.S, how old were you when you immigrated/moved to the United States?

Open ended: _____

- 9 = Prefer not to answer/ not applicable

7) Are you retired?

- 1 = Yes
- 2 = No
- 9 = Prefer not to answer

8) What is or was your primary occupation?

Open ended: _____

- 9 = Prefer not to answer/ not applicable

9) What is the highest grade of school/education you completed?

- 1 = 6 years or less
- 2 = Middle School/Junior High
- 3 = Some high school
- 4 = High school diploma
- 5 = Some college (credits earned but no degree)
- 6 = Associate's degree
- 7 = Bachelors (BA, BS)
- 8 = Graduate degree (MA, MBA, PhD, MD)
- 9 = Prefer not to answer

10) What is your current marital status?

- 1 = Single
- 2 = Separated
- 3 = Divorced
- 4 = Widowed
- 5 = Married
- 6 = In a relationship, but not married
- 9 = Prefer not to answer

11) Which of the following best describes your living arrangements now?

- 1 = Living alone
- 2 = Live with spouse/partner only
- 3 = Live with other family
- 4 = Live with spouse/partner + other family members
- 5 = Live with someone else
- 9 = Prefer not to answer

12) For how long have you lived as a resident in TELACU Las Fuentes?

Open ended: _____ months / years

- 9 = Prefer not to answer

Appendix J

Overall Level of Engagement - Participant's Rating

(Post-intervention)

Please rate your level of engagement in each of the classes part of the learning program.

Circle the number that best represents your situation.

Name _____

Date: _____

English Class

1. How often did you attend English class?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Very	Rarely	Occasion	Sometimes	Somewhat	Often	Very
rarely or	Missed 6	ally	Missed 4	often	Missed 2	Often or
never	classes	Missed 5	classes	Missed 3	classes	always
Missed 7		classes		classes		Missed 1
classes						class or
or more						less

2. How often did you complete the English HW?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Very rarely or never	Rarely	Occasionally	Sometimes	Somewh	Often	Very
Missed 7 HWs or more	Missed 6 HWs	Missed 5 HWs	Missed 4 HWs	at often Missed 3 HWs	Missed 2 HWs	Often or always Missed 1 HW or less

3. How often did you ask questions during English class on average (per class)?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Never	Rarely	Occasionally	Sometimes	Somewha	Often	Very
Asked 0 questions	Asked 1 question on avg.	Asked 2 questions on avg.	Asked 3 questions on avg.	t often Asked 4 questions on avg.	Asked 5 questions on avg.	Often Asked 6 questions or more on avg.

4. How often did you engage in class activities for the English class?

- 9 = Prefer not to answer

Very rarely or never Engaged only 2 times or less	Rarely Engaged 3-5 times	Occasionally Engaged half of the time (6)	Sometimes Engaged 7 of the times	Somewh at often Engaged 8 of the times	Often Engaged 9 of the times	Very Often or always Engaged 10 of the times or more
---	--------------------------------	--	--	--	---------------------------------------	--

5. Overall, I had a high level of engagement for the English class throughout the learning program.

- 9 = Prefer not to answer

1 2 3 4 5 6 7

Strongly	Disagree	Somewhat	Neither	Somewhat	Agree	Strongly
Disagree		disagree	Agree nor	Agree		Agree
			disagree			

Score for level of engagement for the English Class: _____

(Add up the ratings)

Technology Class

1. How often did you attend Technology class?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Very	Rarely	Occasion	Sometimes	Somewhat	Often	Very
rarely or	Missed 6	ally	Missed 4	often	Missed 2	Often or
never	classes	Missed 5	classes	Missed 3	classes	always
Missed 7		classes		classes		Missed 1
classes						class or
or more						less

2. How often did you complete the technology HW?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Very rarely or never	Rarely	Occasionally	Sometimes	Somewh	Often	Very Often or always
Missed 6 HWs	Missed 5 HWs	Missed 4 HWs	Missed 3 HWs	Missed 2 HWs	Missed 1 HW or less	

3. How often did you ask questions during technology class on average (per class)?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Never	Rarely	Occasionally	Sometimes	Somewha	Often	Very Often
Asked 0 questions	Asked 1 question on avg.	Asked 2 questions on avg.	Asked 3 questions on avg.	Asked 4 questions on avg.	Asked 5 questions on avg.	Asked 6 questions or more on avg.

4. How often did you engage in class activities for the technology class?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Very rarely or never Engaged only 2 times or less	Rarely Engaged 3-5 times	Occasionally Engaged half of the time (6)	Sometimes Engaged 7 of the times	Somewh at often Engaged 8 of the times	Often Engaged 9 of the times	Very Often or always Engaged 10 of the times or more

5. Overall, I had a high level of engagement for the Technology class throughout the learning program.

- 9 = Prefer not to answer

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat disagree	Neither Agree nor disagree	Somewhat Agree	Agree	Strongly Agree

Score for level of engagement for the technology Class:_____

(Add up the ratings)

Global level of engagement score in intervention program: _____

(Add up the total scores from each class together)

Appendix K

Rating Experience in Learning Program

1. How would you rate your experience in the English class of the learning program?

- 9 = Prefer not to answer

1 2 3 4 5 6 7

Terrible Very bad Bad Average Good Very Excellent
good

2. How would you rate your instructor for the English class?

- 9 = Prefer not to answer

1 2 3 4 5 6 7

Terrible Very bad Bad Average Good Very Excellent
good

3. How would you rate your experience in the Technology class of the learning program?

- 9 = Prefer not to answer

1 2 3 4 5 6 7

Terrible	Very bad	Bad	Average	Good	Very	Excellent
					good	

4. How would you rate your instructor for the Technology class?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Terrible	Very bad	Bad	Average	Good	Very	Excellent
					good	

5. How would you rate your experience in the learning program overall?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Terrible	Very bad	Bad	Average	Good	Very	Excellent
					good	

6. If a new set of skills were to be taught again in the future, how likely are you to participate again in the program?

- 9 = Prefer not to answer

1	2	3	4	5	6	7
---	---	---	---	---	---	---

Very unlikely	Unlikely	Somewhat Unlikely	Neutral	Somewhat Likely	Likely	Very likely
y						