The Effect of Everyday Informal Learning Activities on Lifelong Learning Mindset and Civic Engagement in U.S. Adults: Towards a Learning Cities Theory of Change

by

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Abstract

The concept of a learning city has existed since the Faure et al. (1972) report proclaimed that lifelong learning was the path to a global learning society where all humans could achieve their best selves and by extension all countries their highest purpose. The rationale for learning cities is built on a belief that "lifelong learning lays the foundation for sustainable social, economic and environmental development" (UNESCO, n.d.). However, empirical research on the impact of using the learning cities framework to achieve those ends is limited, as is the theory to support causality between lifelong learning and social outcomes (Boshier, 2018; Rüber et al., 2018). This study defines the learning city framework as an approach that infuses lifelong and lifewide learning into a city's policies, systems, and operations, as well as into its natural, built, social, and cultural environment for the purpose of developing the full potential of its citizens and by extension the entire community. To gain insight into how lifelong learning might be leveraged in all cities to promote civic engagement, data from U.S. adults in the 2017 PIAAC survey were used to test a two-step fully latent structural regression model to measure the effect of everyday informal learning activities on common characteristics of civic engagement (volunteerism, political self-efficacy, and social trust) through the presence of lifelong learning mindset (LLM). The results showed a positive relationship between informal learning and civic engagement that was strengthened through LLM; however, the data also revealed that participants had high frequencies of informal learning and LLM yet had low levels of civic engagement. This finding could be of concern to learning city organizers because it suggests that citizens can be engaging in high rates of lifelong learning and possess a lifelong learning mindset, yet still have very low opinions of their government. Results also indicated a need for additional research to account for gender, cross-cultural, and skill level differences.

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I am joyful to finally realize a dream that I have held since childhood. When I was six (with the help of my aunts) I sent away for my first college bulletin from the University of Hawaii. Now that I am slightly older than six, I can appreciate the impact of informal learning on achieving this goal—the lived experiences and the shared wisdom gained from every friend, colleague, and passerby. I believe, as Jane Jacobs (1961/1992) wrote:

> People must take a modicum of public responsibility for each other even if they have no ties to each other. This is a lesson nobody learns by being told. It is learned from the experience of having *other people without ties or kinship or close friendship or formal responsibility to you* take a modicum of public responsibility for you (p. 82).

Table of Contents

List of Tables

List of Figures

List of Abbreviations

ICT	Information and Communication Technology
CFA	Confirmatory Factor Analysis
LLL	Lifelong Learning
LLM	Lifelong Learning Mindset
LLT	Lifelong Learning Tendency
NCES	National Center for Education Statistics
OECD	Organization for Economic Cooperation and Development
PIAAC	Program for International Assessment of Adult Competencies
SEM	Structural Equation Modeling
SR	Structural Regression
UNESCO	United Nations Educational, Scientific, and Cultural Organization

CHAPTER 1

INTRODUCTION

In 1971, a group of seven high-level government officials and policy advisors from France, Chile, Syria, Iran, the Soviet Union, the Democratic Republic of the Congo, and the United States were charged by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) to produce a report on the "over-all solutions to the major problems involved in the development of education in a changing universe" (Faure et al., 1972, p. v). One year later, they presented *Learning to be: The world of education today and tomorrow* and proclaimed: "We should no longer assiduously acquire knowledge once and for all, but learn how to build up a continually evolving body of knowledge all through life—'learn to be'" (Faure et al., 1972, p. vi). This document became a call to action for the creation of a learning society, or a culture of lifelong learning for all. Almost concurrently, the Organization for Economic Cooperation and Development (OECD) questioned the ability of educational systems that "front load" all education within the first 16 to 20 years of life to produce social equity. Its report, *Recurrent Education: A Strategy for Lifelong Learning*, argued that education should be spread throughout the life span so it could be used more effectively (Kallen & Bengtsson, 1973). OECD experimented with the concepts in their report by launching six "educating cities" in the 1970s (Longworth, 2006). UNESCO continued to refine their version of the concept by encouraging cities to become "learning cities" as a stepping stone to a global learning society. At the close of the twentieth century, UNESCO published another position paper on lifelong learning, *Learning: The Treasure Within*, which expanded the original "learning to be" motif to include three more pillars: learning to do, learning to understand, and learning to live together (Delors et al., 1996). In 2013, UNESCO created the Global Network of Learning Cities to promote lifelong learning

and the United Nations' 2030 Sustainable Development Goals by establishing a community of practice for cities aspiring to become learning cities. As of December 2021, the network included members from 229 cities representing 65 countries and every continent. UNESCO's and OECD's focus on the importance of lifelong learning to the world's social, economic, cultural, and environmental future laid the foundation for lifelong learning and the learning city framework to become an important topic in education and urban policy.

While the learning cities concept has been a worldwide phenomenon for the past 50 years, 15 out of the 37 member countries of OECD are not members of UNESCO's Global Network of Learning Cities. The United States and Canada are among those 15. This absence of membership, however, should not be taken to imply complete disinterest in learning cities in the U.S. and Canada. Pittsburgh and Edmonton were sites of OECD's educating cities experiment in the 1970s. In 2015, the U.S.-based journal, *New Directions for Adult and Continuing Education*, dedicated its Spring issue to examining "Learning Cities for Adult Learners." Within the last five to 10 years, San Francisco and Vancouver, British Columbia attempted UNESCO-backed learning city initiatives that stalled due to the death of the mayor and a library workers strike respectively (Boshier, 2018). Currently Lowell, Massachusetts is in the early stages of becoming a learning city that appears to be heavily influenced by the UNESCO model (Lowell City of Learning, 2021), and the City of Vancouver (2021) lists "lifelong learning" as a vital element of its "Healthy Cities" framework. The city of Vancouver's website states, "People engaged in lifelong learning are better prepared to participate in civic life and work collaboratively to address common challenges." This statement echoes the belief first promoted by UNESCO and OECD that there is a connection between lifelong learning and civic engagement.

In addition to interest by municipal governments, academics and practitioners in adult education have also pushed to establish learning cities as a theoretical framework in their field. Plumb et al. (2007) asserted that the "concept of the learning city has great promise to inform core theories and practices in the field of adult education" (p. 38). Watson and Wu (2015) invited adult educators to "continue the dialogue" about learning cities in the United States because they have the "educational background, expertise, and experience necessary to take the lead in establishing a forum where citizens from multiple sectors of society can come together and discuss, apply, and research learning city philosophy and practice" (p. 13).

Despite this ongoing focus and interest, many involved with learning city initiatives have challenged whether they will ever be able to deliver on the vision imagined by UNESCO and OECD as the catalysts for a future where every person can reach their full potential through access to lifelong learning. For example, Kwon and Schied (2009) admitted "the political, social, and economic rationale for the South Korean Lifelong Learning Cities movement has not been adequately addressed. Nor has the impact on society been adequately dealt with" (p. 201). Scott (2015) called learning cities a "thrilling topic" but also "shortsighted" if not enough attention is given to finding long-term solutions to the problems learning cities are trying to address (p. 85). Kearns (2012) noted that while the learning city concept can be used to "[foster] well-being for all . . . [it] has not been sufficiently realized" (p. 370). One of the harshest criticisms of the non-movement of the learning city movement comes from Boshier (2018) who questioned whether the "average citizen" would "know what distinguishes a learning from a non-Learning City" (p. 421).

Boshier (2018) is not only a critic of learning cities, but also a key figure in their development and one of their biggest supporters. Boshier (2018) has been involved with

establishing learning cities in China and "helped launch the Faure report in New Zealand" (p. 420). He is a Canadian who lives in Vancouver where the initiative never gained momentum as a UNESCO-recognized learning city. He understands why learning cities can be valuable and also why they never materialize. His 2018 article "Learning cities: fake news or the real deal?" outlined seven key research questions that need to be answered about learning cities if the movement hopes to continue moving forward. Two of these questions inspired this study: "How do people learn in informal settings?" and "Which parts of Adult Education can best inform emerging theory and practice concerning the creation and operation of Learning Cities?" (Boshier, 2018, p. 432-433).

Established learning cities have shown a tendency to favor formal and non-formal learning experiences over informal, and this overdependence on formal learning has been a major obstacle in creating and sustaining learning cities (Boshier, 2018). Another obstacle to learning cities achieving their potential may be an overemphasis on the economic benefits of lifelong learning to the exclusion of social benefits. Plumb et al. (2007) argued that this worldview is causing a growing divide rather than building the type of learning society that Faure envisioned. More research is clearly needed on the non-economic benefits of lifelong learning, such as increased civic engagement (Campbell, 2006). Furthermore, the real issue facing researchers and practitioners of learning cities may be the default position that a learning city is something that needs to be created rather than a recognition of what already exists. Buchczyk and Facer (2018) found that everyday informal learning activities were important in helping marginalized and disenfranchised city residents reap the benefits of lifelong learning, especially in cases where formal and nonformal learning had not reached them. Their research

highlighted the potential of informal learning to impact society through transformative learning experiences.

Statement of the Problem

UNESCO's rationale for learning cities is built on a belief that "lifelong learning lays the foundation for sustainable social, economic and environmental development" (n.d.). The goal of members of UNESCO's Global Network of Learning Cities is to "promote lifelong learning for all," by applying the learning cities framework to increase "individual empowerment and social inclusion, economic development and cultural prosperity, and sustainable development" (UNESCO, n.d.). When governments use the learning city framework as an intervention to increase civic engagement or as a means to empower citizens to become local problem solvers, they are promoting a theory of change that implies certain causal relationships between lifelong learning and these positive, desired changes in their communities. However, according to Boshier (2018), this theory of change has not been sufficiently tested. Additionally, much continues to be unknown about the effect of informal learning (the most widespread and accessible type of learning) on lifelong learning outcomes, such as developing the mindset of a lifelong learner and exhibiting characteristics related to civic engagement (Campbell, 2006). Finally, a preference for the artificially created learning city (i.e., one defined by municipal resolution) over the organic, "already existing" learning city may lead to an underappreciation of the impact of everyday informal learning activities on the transformational learning experiences of city residents (Buchczyk & Facer, 2018).

Purpose of the Study

The purpose of this study was to construct a testable model for how everyday informal learning activities, such as reading a newspaper or using the Internet to find more information

about issues, may influence one's lifelong learning mindset, as well as how this mindset affects three types of civic engagement: frequency of volunteerism, sense of political efficacy, and level of social trust. The intention of this study was to add to the theoretical understanding of how learning cities' promotion of lifelong learning may impact the types of positive social change that lead to individual empowerment and social inclusion.

Research Questions

This study posed the following research questions and tested seven hypotheses:

1. What latent structure best explains the variability in response patterns related to frequency of everyday informal learning activities?
    a. H1: The eight most common everyday learning activities (ILA) of respondents to the PIAAC are reliable indicators of one latent factor called informal learning (INFLRN).
    b. H2: Informal learning can be reliably measured by dividing the eight most common ILAs in the PIAAC into unique indicators assigned to three latent factors (LIT, NUM, and TECH).
    c. H2-1: Informal learning can be reliably measured by dividing the eight most common ILAs in the PIAAC into unique indicators assigned to two latent factors (LITECH and NUM).
2. What latent structure best explains the variability in response patterns related to level of agreement with statements related to learning strategy?
    a. H3: The six learning strategies (LS) questions in the PIAAC are reliable indicators of one latent factor called lifelong learning mindset.

b. H4: Lifelong Learning Mindset can be reliably measured by dividing the six learning strategies questions in the PIAAC into unique indicators assigned to three latent factors (MOTIVE, PERSIST, and SELFDIR).
c. H5: Lifelong Learning Mindset can be reliably measured by dividing the six learning strategies questions in the PIAAC into unique indicators assigned to two latent factors (MOTPER and SELFDIR).

3. To what extent can civic engagement (CIVENG) be measured through factors related to volunteerism, political self-efficacy, and social trust?
    a. H6: The four civic engagement (CE) questions in the PIAAC are reliable indicators of one latent factor called CIVENG.
4. What is the relationship between informal learning (INFLRN) and lifelong learning mindset (LLM)?
5. What is the relationship between lifelong learning mindset (LLM) and civic engagement (CIVENG)?
6. What is the effect of informal learning (INFLRN) mediated by lifelong learning mindset (LLM) on civic engagement (CIVENG)?

Conceptual Framework

The conceptual framework relevant to learning cities is transformative learning theory. The transition toward a learning society as envisioned by UNESCO and the OECD necessitates transformational changes in governance and educational systems, which requires transformational changes in how citizens perceive their roles in those systems. Mezirow (1997) presented transformative learning as an explanation of how adults are able to change their ways of thinking and being: “Thinking as an autonomous and responsible agent is essential for full

citizenship in democracy and for moral decision making in decisions of rapid change" (p. 7). Modifications to Mezirow's original theory have expanded transformational learning to include not only changes to the individual, but also to society and the planet (Taylor, 2008).

Significance of the Study

Insufficient empirical research has been conducted on analyzing the relationship between informal lifelong learning and civic engagement. This study provides insight into how lifelong learning might be leveraged in all cities to promote civic engagement by exploring the relationship between everyday informal learning activities and lifelong learning mindset (LLM), as well as the effect of LLM on common characteristics of civic engagement (volunteerism, political self-efficacy, and social trust). This study describes a quantifiable path between theory and praxis which could make implementation and evaluation of the learning city framework more meaningful to adult education scholars and practitioners. This path may be especially useful to U.S. cities as direct experience with learning cities is limited in this country.

Study Design

This study used a two-step structural regression analysis to test a conceptual model proposed by Rüber et al. (2018) that explained how adult learning affects civic participation. Factors in the Rüber model were matched with items on the 2017 Program for International Assessment of Adult Competencies (PIAAC) background survey. Data from the PIAAC were used to construct latent variables for informal learning, lifelong learning mindset, and civic engagement and tested using confirmatory factor analysis to determine the best fitting models for each variable. Finally, a fully latent structural regression model was used to analyze the effect of informal learning on civic engagement through lifelong learning mindset.

Possible Limitations and Delimitations

This study used a secondary dataset, the 2017 Program for International Assessment of Adult Competencies (PIAAC), and is therefore delimited by the type and amount of data that were collected during that cycle. Because this study used secondary data, only factors represented by these existing data could be entered into the research model. Civic engagement includes a range of diverse behaviors from voting to volunteering to advocacy to fundraising to community decision making, but this study was limited to examining frequency of volunteering, sense of political self-efficacy, and level of social trust, because these were the only types of civic engagement included on the PIAAC background questionnaire (Desjardins, 2020; Rhodes et al., 2019; Rose et al., 2019). The question on volunteerism in the PIAAC covers any type of volunteerism and its frequency. It does not differentiate between political and non-political service, nor does it include reasons for volunteerism. Furthermore, the PIAAC background questionnaire asks respondents if they have engaged in certain "everyday activities" (informal learning activities) in "the past 12 months." Respondents are also asked if they have participated in volunteer work during that same 12-month time period. This survey structure makes it impossible to determine if a learning activity occurred before a volunteer experience, at the same time, or in reverse order. This presents challenges in evaluating a causal relationship between informal learning activities and volunteerism based on the PIAAC data alone. However, other indicators, such as beliefs about learning and attitudes about civic engagement are point-in-time questions, indicative of how respondents felt the day of the survey, which does allow the possibility that activities engaged in during the previous 12 months had an effect on those beliefs and attitudes. These limitations are balanced by several advantages of using secondary data.

Specifically, the PIAAC is a nationally representative sample of U.S. adults with a large sample size (3,660) capable of supporting a valid, multi-path structural equation model.

Definition of Terms

The following terms are used in this study:

1. Civic engagement--"working to make a difference in the civic life of [one's community] and developing the combination of knowledge, skills, values and motivation to make that difference. It means promoting the quality of life in a community, through both political and non-political processes" (Ehrlich, 2000, p. vi).
2. Formal learning—learning that occurs as part of a program leading to a recognized degree, such as high school or college. It is always intentional, planned, and conscious.
3. Informal learning—learning that is not delivered as a course, but occurs through less formal interactions with a coach, guide, or peer, or through self-study; it does not lead to a degree, but may result in earning a badge. It may be intentional or unintentional, planned or spontaneous, conscious or unconscious.
4. Learning city—any city that embraces and infuses lifelong and lifewide learning into its policies, systems, and operations, as well as into its natural, built, social, and cultural environment for the purpose of developing the full potential of its citizens and by extension the entire community. Individual learning cities may create and use their own definition of a learning city. Cities that are members of the UNESCO Learning Cities Network use the

following definition: “a city that effectively mobilizes its resources in every sector to promote inclusive learning from basic to higher education; revitalizes learning in families and communities; facilitates learning for and in the workplace; extends the use of modern learning technologies; enhances quality and excellence in learning; and fosters a culture of learning throughout life” (UNESCO).

5. Lifelong learning—learning that occurs after childhood formal education has concluded (generally assumed to be at the start of a career or first professional employment) and continues throughout one’s life; it may be formal, non-formal, or informal.
6. Lifewide learning—learning that occurs in any place at any time. It is not restricted to specialized classrooms, specific institutions, or formal instructors.
7. Non-formal learning—learning that may occur as part of a structured course, but does not typically lead to a degree, such as workplace training or community-based learning programs. It is always intentional, planned, and conscious.
8. Praxis—action that is informed through learning and reflection; frequently associated with altruistic actions, tolerance, and truth-seeking.
9. Self-Actualization—the highest level of psycho-social human development according to Abraham Maslow’s Hierarchy of Needs. The self-actualized person typically displays the following characteristics: creativity, sense of purpose, tolerance, connection with all humanity, and self-acceptance.

10. Theory of change—an explanation of how a program or intervention creates the change it has been designed to effect. It maps how the conditions for the change to occur relate causally to the desired outcomes.
11. Transformative learning—a theory of learning developed by Jack Mezirow that states learning occurs through transformative experiences. These experiences result from events that contradict existing ways of thinking or knowing, and which upon reflection generate new ways of making meaning.

Organization of the Study

This study is organized as five chapters. Chapter one, Introduction, provides an overview of the rationale for this study. It states the problem this study addressed, the research questions used to gain insight into the problem, as well as the significance of addressing this problem through research.

Chapter two, Literature Review, builds the background necessary to understand the context of the research problem. A variety of sources were consulted, such as peer-reviewed journal articles, scholarly books, conference proceedings, and government websites.

Chapter three, Methods, explains the research design and types of analysis used in order to conduct the study.

Chapter four, Results, presents the data collected and the findings of the study. This chapter aligns the data and analysis to each research question, but does not draw conclusions from the data.

Chapter five, Conclusions, explains how the study's findings may inform the problem and assesses the hypotheses inherent in each research question. It also presents recommendations for further study.

CHAPTER 2

LITERATURE REVIEW

Introduction

According to the UNESCO Institute for Lifelong Learning (2015), "Learning cities enable their citizens to learn throughout life. In doing so, they enhance individual empowerment, social cohesion, and economic and cultural prosperity" (p. 3). Implicit in this statement is a theory of change that lifelong learning has the ability to cause transformational change in adults. To analyze the learning city framework as a reasonable vehicle for social changes such as "individual empowerment" and "social cohesion," it is helpful to view learning city theory, lifelong learning, and civic engagement through the lens of transformative learning theory. This chapter reviews the literature on transformative learning theory, learning city theory, and lifelong learning as a means of social transformation. Given that the purpose of this study is to analyze the effect of everyday informal learning activities on civic engagement through lifelong learning mindset, several instruments that have been created to measure informal learning, lifelong learning, and civic engagement as constructs are examined. This literature review provides a foundation for how the latent variables in this study were constructed. Additionally, previous research on the relationships between informal learning activities, lifelong learning mindset, and civic engagement are presented as support for the structural regression model this study tested. Finally, gaps in the research are identified.

Transformative Learning Theory

Transformative learning theory seeks to explain how adults' learning experiences result in changes to their existing perspective, or "frames of reference" (Mezirow, 1997). The term and the theory originated with Jack Mezirow in his study on the effects of returning to education or

the workforce on women who had not been engaged in either for a long period of their lives (Kitchenham, 2008). Mezirow theorized that persons who undergo transformative learning work through a series of phases. The first phase and instigating action is a "disorienting dilemma" (Mezirow, 1978). In this situation, learners are presented with an experience that conflicts with their previous knowledge and experience. As a result of the "dilemma" learners begin a process of self-reflection that leads to exploring new options, gathering knowledge about these options, experimenting with them, and ultimately building the competency and self-confidence to reintegrate this new way of being and thinking into their existing mindset (Mezirow, 1978).

While Mezirow laid a solid foundation for the theory, he did not address every aspect of transformative learning. Taylor (2008) argues that the "ubiquitous acceptance" of Mezirow's concept of transformative learning has frequently led to the dismissal of other theorists' contributions to the field, such as those addressing "spirituality, positionality, emancipatory learning, and neurobiology" (p. 7). One addition to Mezirow's original theory is called planetary transformative learning. This type of transformation is not only concerned with how humans see each other, but also how people interact with the physical world around them (Taylor, 2008). This expanded view of transformative learning can inform the study of learning cities because typically their goal is societal change, and not solely personal transformation.

Cranton and Taylor (2012) contended that there is a need to reject dualistic thinking about transformative learning theory and to gather the diversity of perspectives "under one theoretical umbrella" (p. 3). This shift would allow researchers to explore both individual-level changes and social changes in perspective, as well as support self-directed learning and relational learning. They believed allowing the space for multiple approaches is necessary to maintain the "complexity of the field of adult education" (p. 3). The authors posited that one way to unify the

differing perspectives on transformative learning is to acknowledge the role of constructivism (meaning is built through experience and the perception of that experience). They argued that while the processes that caused the construction may be rational, spiritual, or intuitive, "the meaning is still constructed; it does not exist as an absolute truth outside of the self" (Cranton & Taylor, 2013, p. 8). This expanded view of transformative learning better enables it to account for the effect of informal learning (experiences) on lifelong learning mindset (a potential perspective change), and the resulting individual and social changes made through increased civic engagement.

One challenge of using everyday activities as sources of informal learning capable of causing transformative change is the seeming lack of opportunity for critical reflection (which Mezirow theorized is vital to the process of transformative learning). This requirement implies that informal learning experiences, especially the spontaneous or subconscious varieties, do not provide for the reflective thinking necessary to result in perspective change. However, subsequent transformative learning theorists have expanded Mezirow's foundational concepts to incorporate multiple ways of knowing. Gunnlaugson (2007) categorized these later transformative learning theorists as the "second wave" of transformative learning theory (p. 135). Gunnlaugson (2007) used Mezirow's premise that the root of transformative learning is human communication and replaced the "critical reflection" process with "generative dialogue" (p. 135). While critical reflection depends on meta-cognition, generative dialogue relies on meta-awareness. Generative dialogue allows transformation to occur through shifts in consciousness as behaviors and emotions become observable objects. However, meta-awareness, like meta-cognition is a skill that one must work at to master. Nonetheless, the second wave of

transformative learning theory offers greater explanatory options for how everyday activities can transform one's mindset and civic engagement patterns.

Scholars who are interested in the practical application of transformative learning theory have sought to explain the process of how the ideals of the theory can be operationalized to effect real-world change. Christie et al.'s (2015) conclusion based on case studies of applied transformative learning makes a case for connecting the path from learning to lifelong learning mindset to civic engagement: "If students are given the motivation, the means and the knowledge necessary to critically assess, challenge and change their assumptions they will have the chance to become lifelong learners capable of acting for the best in a rapidly changing world" (p. 22). This statement implies that being a lifelong learner can equip one with the abilities necessary for impactful civic engagement.

One example of a tool that can be used to enable lifelong learners to experience transformative civic learning is psychogeographic mapping. Psychogeography, conceived simultaneously in the 1950s Paris and Boston by Guy Debord and Kevin Lynch respectively, is the integration of psychology and geography that seeks to make meaning through reflecting on state of mind as it relates to interaction with the physical environment (Wood, 2010). Biesta and Cowell (2012) used this technique in a community education project to demonstrate how learning occurs when citizens are asked to generate knowledge from their experience rather than being seen as empty receptacles that need an intervention (the traditional deficit model of community education). They suggested that the "translation of private interests into public concerns" is a transformative process that can and should be navigated communally with diverse groups of citizens. This research is an example of planetary transformative learning theory in

action as it demonstrated how individual learning can coexist with communal learning to create change in the physical and social landscape.

While the connection between transformative learning theory and practice has sometimes been elusive, Biao (2013) made the case for action to be informed by a relevant theory to be successful. He blamed the failed attempts at implementing learning cities in Africa on a lack of an appropriate learning methodology for the initiatives. He proposed transformative learning theory as the best approach because it "usually results from an active and vigorous interaction between the self and the environment" (Biao, 2013, p. 7). However, Kang and Cho (2017) criticized the universality of transformative learning as a global theory. South Korea is a leader in the UNESCO Learning City movement accounting for 50 of the currently recognized 229 members of the Global Network of Learning Cities (UNESCO Institute for Lifelong Learning, nd). Kang and Cho (2017) challenged the notion that transformative learning theory should be used without question in Korea. They classified transformative learning as a "traveling theory" or one that has been taken out of its original socio-cultural and historical context for use in a different time and place. To support this notion, they evaluated 15 recent academic journal articles that explicitly used Mezirow's version of transformative learning as their theoretical framework. Focusing on the key component of perspective transformation, their analysis revealed that none of the 15 studies showed sufficient evidence to demonstrate that perspective transformation had occurred although the authors of each study claimed that it had. For example, many authors used "actions" as evidence that a transformation in perspective had occurred without actually showing that the original frame of reference had changed. Kang and Cho (2017) recommend using a "creative misreading" to "challenge a traveling theory seriously" (p. 172). One example they provided is the substitution of "orienting dilemmas" for "disorienting

dilemmas." This shift occurs in populations where instability is the norm and a switch to a more stable environment is what may cause a perspective change. While the current study is focused on the United States where the effects of travelling theory might not seem to apply, economically disadvantaged communities in the U.S. may have more in common with Korea in terms of growing up with instability than they do with more prosperous U.S. neighborhoods. Again, taking an expanded view of transformative learning theory, one beyond Mezirow's original description, benefitted this study.

Learning City Theory

The learning city framework is based on two position papers published in the early 1970s that stressed the necessity of transitioning the world's current approach to education from formal and concentrated at the beginning of life to a system that is both lifelong and lifewide. The first, commonly referred to as the Faure report, was published by UNESCO in 1972. The preface presented the case for the coming revolution in education and positioned lifelong learning as an act of civic participation (in the form of protest):

> Wherever we find a traditional educational system which has stood the test of time and was generally thought to need no more than a few occasional minor improvements, a few more or less automatic adjustments, it is currently unleashing an avalanche of criticisms and suggestions which often go so far as to question it in its entirety. Some young people are now more or less openly protesting against the pedagogic models and types of institutions imposed on them, although it is not always easy to delimit the influence of this particular phenomenon, with its vague uneasiness and flashes of rebellion. (Faure et al., 1972, p. xix).

In 1973, the Organization for Economic Co-operation and Development (OECD) published *Recurrent Education: A Strategy for Lifelong Learning*. While the UNESCO approach to learning cities has generally been described as humanistic and the OECD approach as neo-liberal (Elfert, 2015), Kallen and Bengtsson's (1973) preface to the OECD report demonstrated an equal revolutionary zeal:

> In other words, something like 15-20 years of continuous presence in educational systems appears to be seen as the-best way of developing the individual and of achieving social equality. The concept of recurrent education is based on a different approach - namely that education opportunities should be spread out over the individual's lifetime, as an alternative to the ever-lengthening period of continuing education for youth. There are many reasons for moving in this direction. First, educational expansion has not played the role in social equality that was foreseen. Second, some form of continuing or permanent education is indispensable in societies where social and economic change calls for continuing social and occupational adjustment by individuals. Third, the divorce of formal education from learning by experience, which has typified most educational systems, is making some form of "deschooling" a necessity (p. 5).

Both UNESCO and OECD pushed to implement lifelong learning more systematically to create a learning society: UNESCO for global evolution through self-actualization and OECD for global economic prosperity through increased competency and productivity. The current study utilized elements of both the UNESCO and OECD approaches to learning cities. The PIAAC dataset used for analysis is an OECD product and the connection between lifelong learning and social change through civic engagement is a UNESCO ideal.

Throughout the past 50 years, the perceived benefits of integrating lifelong learning into society have inspired governments to experiment with operationalizing this concept as learning cities. However, there has never been complete consensus on what a learning city actually is. Longworth (2006), one of the first scholar/practitioners of learning city theory, remarked that the learning cities he observed were a "peculiar mix of the political, economic, social, financial, environmental, cultural, educational, and technological" (p. 20), and if one were to leave any of those components out of the definition that it would be incomplete. One of the most widely cited definitions of a learning city is the UNESCO Institute for Lifelong Learning (2015) version which recognizes a learning city as any city that

> . . . effectively mobilizes its resources in every sector to promote inclusive learning from basic to higher education; revitalizes learning in families and communities; facilitates learning for and in the workplace; extends the use of modern learning technologies; enhances quality and excellence in learning; and fosters a culture of learning throughout life (p. 9).

This definition implies that a learning city is any place where learning systematically supports every aspect of one's life from birth to grave. Scott (2015), however, countered that the "term learning cities is not original, but rather the newest installment in providing education and learning to the widest population of learner" (p. 85). He maintained that the term can easily be interchanged with older terms and concepts such as learning societies, lifelong education, lifelong learning, and organizational learning. Therefore, to Scott, "learning city" and "lifelong learning" are synonyms. While the purpose of this study is to inform learning city theory, it is important to not get distracted by whether a place is or is not an officially recognized or self-proclaimed learning city. The results of this study should be generalizable to learning cities,

lifelong learning, or any other synonymous term as Scott suggested. For that reason, this study used the term "learning cities framework" to differentiate that this research does not apply to a specific city or type of city, but rather to any city or process that seeks to use lifelong learning to achieve greater social outcomes.

To support this expanded notion of learning city into a broader theory, it is useful to review some of the other definitions scholars and practitioners have used. For example, Plumb et al. (2007) took a critical approach when defining the "learning" part of learning city. They believed that "a city becomes a learning city not just when learning prevails, but when a certain *type* (authors' emphasis) of learning prevails" (Plumb et al., 2007, p.44). To prove their point, they contrasted the less-than-noble forms of "survival" learning that occur in poverty-stricken neighborhoods where residents "learn" how to sell drugs or become skilled sex trade workers with the typical tendency to "glorify the positive virtues of learning" without much thought to how the context for learning impacts outcomes, such as the learning that takes place in urban slums (Plumb et al., 2007, p.44). Citizen-participants in several learning city initiatives have offered their own definitions of a learning city: "a way of branding the collective learning activities of a city;" "a city that embraces the culture of continuous development of skills in both young and old;" and "a city where all the key stakeholders are signed up to a strategy that embeds a culture of lifelong learning" (Jones, 2010, p. 335).

While these competing definitions of learning cities provide diverse views of the concept, they each imply that the intended purpose of the lifelong learning component is essential to understanding learning cities. Having multiple purposes complicates the definition; however, McFarlane (2011) has come closest to creating a unifying purpose for learning cities as he advocated for "the city as a machine for learning" (p. 360). He offered that "[l]earning is a

central infrastructure of urban change, politics, and everyday life" (p. 362). His conceptualization suggested that cities are formed through acts of learning. Viewed from this perspective, the overall purpose of learning cities could be their intentional recognition of the city as a learning machine with the output produced by that "machine" a direct reflection of how well a city's "raw materials" (people, institutions, relationships) are processed into a quality "product."

Another approach to a unifying purpose for learning cities is to view the city as a mechanism for place-based, experiential learning. This meaning aligns more closely with the idea of a learning city as a source of knowledge production rather than one of economic production. Henthorn (2013) provided an example from Flint, Michigan where he taught university courses using the city as a vital component of the learning. He used a combination of service-learning projects and class readings to pose two questions: "How was the city constructed . . . and what have been the consequences?" (p. 453). He remarked that his students demonstrated a new passion for research due to their experience and "most significant" was that most students "discovered the intensely personal connection average people have with the past" (p. 458). This purpose for the learning city could lead to more engaged learners and citizens.

Another way to imagine a generalized purpose for learning cities is to think of the city as one super-system that functions as a "learning organization" that takes the form of "collaborative cross-organization task forces" (Yorks and Barto, 2015, p. 41). These task forces would use structured learning processes such as coaching networks or learning communities to move from "fragmented" to "pooled" learning (p. 41). Yorks and Barto (2015) admitted that this type of learning city would be "ambitious," but offered an example from South Carolina where the State, industry, and workers collaborated to create synergy around apprenticeship programs as a means

of providing more on-the-job training and decreasing worker shortages in health care and advanced manufacturing.

In addition to establishing a unifying purpose for learning cities, the framework itself needs mechanisms to measure and evaluate it against that purpose. However, as Fitzgerald and Zientek (2015) argued, most learning cities are missing this "critical element" (p. 23) of outcome evaluation. They urged more institutions of higher education, especially those already involved in community engagement scholarship to partner with learning city initiatives and start asking questions to inform better decision making by the leaders of these initiatives. Preisinger-Kleine (2013) concurred with this need for more evaluation and offered some reasons for why it has been lacking. He acknowledged that "some of the existing learning cities" have made "substantial efforts to develop quality criteria to measure the progress made," but much work remains in defining "broadly accepted, valuable indicators that can be adapted to their different objectives and stages" (p. 524). Furthermore, he has observed that evaluation is frequently seen as an "add-on" or extra demand to comply with, and often done only on an "unsystematic basis" (p. 524).

Formal tools have been developed and implemented to measure various aspects of learning cities. One popular method was called "learning city audits" (Longworth, 2006, p. 61). For example, Longworth (2006) described the TELS project (Towards a European Learning Society) which took place between 1998 and 2001. The study used an audit tool to evaluate six European cities that had declared themselves to be learning cities. The results showed that many cities were actually doing very little to promote lifelong learning and most faced a "steep learning curve" (p. 64). Longworth's research also showed that while some "productive partnerships" existed, they were not "in the volume that would make a real difference to a

learning city" (p. 65). To remedy this lack of necessary knowledge and inconsistency in quality indicators, UNESCO launched the International Platform for Learning Cities in 2013. At that time, more than 1,000 cities worldwide had promised to "build learning/educating cities" (Osborne et al., 2013, p. 412). Since 2015, UNESCO has recognized 48 communities with the biennial "Learning City Award" that showcases best practices in learning city development and evaluates implementation of the UNESCO Global Network of Learning Cities guiding documents (UNESCO, n.d.). However, only members of the Network are eligible for evaluation and award consideration, which does not make this a generalizable tool for evaluating the learning cities framework.

Additional research has suggested that community stakeholders do view becoming a learning city as beneficial, but may not see it as important "as achieving the underpinning aim of having a focus on learning as a driver for quality of life, change, and democracy" (Jones, 2010, p. 346). A series of focus groups conducted in Portsmouth, England to assess what the community thought about its leaders' decision to become a learning city revealed that the term was "ambiguous" and that "formal adoption of the learning city banner might take energy and focus off the main aim of ensuring that learning is valued" (p. 346). Jones recommended keeping the concept, but not forcing the label. He suggested a need for more alternatives than the typical focus on promoting formal versus informal learning. This recommendation was part of the basis for the current study and the reason this study used terms such as "learning city framework" or "learning city theory" rather than simply "learning city" when discussing theory. An underlying assumption of this study is that official recognition and use of the term learning city is irrelevant to the outcomes that can be achieved through the "already existing learning city" that Buchczyk and Facer (2018) described. As Boshier (2018) determined, a learning city is both a process and

a place. The current study considered it a theoretical framework that that can be used to understand how lifelong learning occurs in cities and what effects that learning has on the mindset and civic engagement of citizens.

Lifelong Learning as a Means of Social Transformation

One challenge to operationalizing learning city theory into actual learning cities, is the persistent debate on the overall purpose of lifelong learning, or the reason why one should continue to learn throughout life well past initial formal schooling. The early position papers tended to portray lifelong learning from a humanist perspective (Faure et al., 1972) or an economic development perspective (Kallen & Bengtsson, 1973). Elfert (2020) has documented this dichotomy and declared the OECD skills-based version of lifelong learning the "winner" because that is the rationale for lifelong learning that most governments embrace and enact as policy, and the UNESCO human-potential version an "unfailure" because the humanistic vision continues "to capture the imagination of scholars and educators" (p. 18). Elfert (2019) noted that the "meaning of lifelong learning [has] changed . . . from being an 'element of freedom' to 'the educational response to the new market order'" (p. 2). However, Elfert (2019) also admitted that the humanist versus economic debate surrounding lifelong learning may be irrelevant or even detrimental. Su (2010) concurred with that position and questioned the assumption that the rationale for moving towards a learning society should be to prepare citizens to deal with change (either economic or civic). He posited that embracing the intrinsic value of a learning society, one where citizens learn simply because they want to, would better serve the movement. Su (2010) cautioned against using the "instrumentality" approach to lifelong learning, that is, making it a means to an end rather than a valid end itself because this devalues the learner.

This potential devaluation of the learner is reflected in Buchczyk and Facer's (2018) argument that prevalent descriptions of the learning city (including the widely used UNESCO definition) frame the concept as an object that is intentionally constructed, which requires collecting specific resources for a pre-defined purpose. They felt that these types of definitions ignore and marginalize the learning that happens every day in every city without formal declarations. Through the use of ethnographic research in Bristol, United Kingdom (a member of the UNESCO Global Network of Learning Cities since 2017), they discovered the many pathways that citizens take through their everyday activities and documented the learning that took place. Their research revealed that many "average" people who had "fallen through the cracks" and not benefited from formal learning were able to take advantage of daily experiences in the city to increase their knowledge and skills through informal learning. This discovery aligns with Jarvis (2008) who stated that learning "skills must be undertaken through the act of doing and therefore, experiencing. . . but doing something is not just an act, it has cognitive and affective dimensions as well" (p. 12).

Further evidence of the important role that informal lifelong learning may play in social transformation is found in Carr, et al. (2018) who observed a strong correlation between informal lifelong learning and personal empowerment. Interestingly, their research did not find a strong relationship between formal education and empowerment or a strong correlation between formal education and participation in lifelong learning. They concluded that "transformative non-formal and informal learning play a key role in the empowerment process" (81). This finding highlights the need for exploring the role of informal learning when evaluating the role of lifelong learning in the learning cities framework.

The foundation of adult education in the United States has its roots in civic education (Imel, 2012). From the lyceums and chautauquas of the 19th Century that used community lecture and discussion as educational tools to early programs for new immigrants, adult education was strongly linked with developing citizens' potential to contribute to the "common good" (p. 7; Brown, 1936). This historical relationship provides additional support for the theoretical relationship between lifelong learning and civic engagement. However, modern conditions may threaten this historical link. Chickering (2008) presented the main challenge of fostering civic engagement through education today: the overabundance of misinformation that is consumed by a population that is not taught how to think reflectively and logically about what they are seeing and hearing. He affirmed "encouraging adult development—strengthening affective and cognitive complexity—has never been more important," yet cautioned that "culturally and politically our society seems to be stuck at the self-protective, opportunistic, and conformist levels" (Chickering, 2008, p. 52). Several recent studies on the effects of community-focused learning or service learning and attitudes towards civic responsibility have shown a positive connection between the two (Sze-Yeung Lai & Chi-leung Hui, 2021; Snell, et al., 2015). These findings may indicate the necessity of Mezirow's "critical reflection" or Gunnlaugson's (2007) "generative dialogue" components of transformative learning theory when leveraging lifelong learning for social change.

The Challenge of Measuring Factors Related to Learning Cities

Lifelong learning that is aligned primarily with economic benefits may make achieving social benefits more difficult. Furthermore, one of the disadvantages of focusing exclusively on the mastery of skills when evaluating lifelong learning is the tendency to render the humanistic benefits invisible; however, these are the variables most likely related to civic engagement and

need to be measured (Rubenson, 2019). A broadened approach to selecting and evaluating indicators of lifelong learning for the purpose of measuring progress on social progress is needed. Rubenson (2019) critiqued two instruments: the PIAAC and the European Union's Adult Education Survey (AES), which he felt are too focused on skills for employment and (especially in the case of the PIAAC) do not adequately address informal learning and non-economic returns on education. He cautioned that measurement continues to focus exclusively on "economic productivity and employability, despite the trend that social and cultural practices are shifting in ways that require higher levels of skills for full participation in democratic processes, cultural life, and increasingly complex everyday contexts" (p. 304).

On the more humanistic side of the lifelong learning spectrum, Kirby, et al. (2010) created a scale to measure lifelong learning based on constructs from the Faure report. Their instrument used five dimensions: "goal-setting, application of knowledge and skills, self-direction and self-evaluation, information location, and learning strategy adaptation" (Kirby, et al. 2010, p. 294). They found that the factors that contributed to one's interest in lifelong learning were a combination of characteristics established early in life and current situational experiences. A better understanding of these factors is necessary to instill a lifelong learning mindset in children and continue to foster it into adulthood.

Thomas (2017) examined the significance of everyday learning (EDL) on overall learning outcomes and posited that the effects of EDL on adults is "more complex" and reaches farther "beyond the individual than previously established" (p. 308). Because the majority of adult learning is informal, research concerning adults should synthesize multiple approaches to viewing educational outcomes. Thomas (2017) further argued that these outcomes will be different for different people depending on context. For example, one study participant learned to

be more independent through the process of her divorce, while her ex-husband did not have the same learning outcomes. The couple's teen-age daughters had yet another learning outcome based on that same (or similar) learning experience. Allowing for a broader framework to view learning outcomes (one that is not simply economic or social) and acknowledging this complexity enables researchers to place more emphasis on EDL as a topic worthy of investigation. EDL of all types (positive, negative, and mixed) have the potential to lead to change and this area requires more research and inclusion on instruments to measure the outcomes of learning cities and lifelong learning. The study and measurement of EDL could increase understanding of the non-economic outcomes of lifelong learning.

Building a Model: The Rüber Model

Rüber et al. (2018) sought to fill a gap in the literature that "fails to identify and coherently explain non-monetary outcomes" of adult learning (p. 543). The authors built a conceptual model based on an analysis of 13 empirical studies of the relationship between civic engagement and lifelong learning to explain the "mechanisms through which learning may influence civic participation" (Rüber et al., 2018, p. 543). They found that all of the studies they reviewed indicated a positive relationship between adult learning and civic participation; however, they could not find satisfactory evidence of a causal relationship. They determined there were two reasons for a lack of evidence-based causality: not enough theoretical foundation and insufficient methods. The Rüber model operationalized civic participation as volunteering because they found that it was one of the most commonly used indicators of civic participation, which resulted in the literature on volunteering being more advanced in relation to some of the other types of participation. The authors also believed that volunteerism was a topic of great interest to scholars because of its positive impact to both individuals and society. This feature

aligns with the learning city framework, which provides benefits to both citizens and their city. The authors admitted that a limitation of their model is that it is based primarily on a Western perspective of learning and civic engagement, which some have argued is also a limitation of the learning city framework (Boshier, 2018; Biao, 2013).

As a starting point, the Rüber model was organized around Schuller et al.'s (2004) concept of the three types of capital: human, social, and identity, which informed most of the studies conducted on the relationship or effect of adult learning on civic engagement. Schuller et al. (2002) defined human capital as "the knowledge, skills, and qualifications that individuals acquire as a consequence of organised [sic] learning" (p. 8-9); social capital as "the norms and networks that bring people together to mutual advantage" (p. 9); and identity capital as "the characteristics of the individual that define his or her outlook and self-image" (p.11). During their analysis, Rüber et al. (2018) did find evidence that both human and social capital had some explanatory value regarding the effect of adult learning on civic participation; however, none of the studies they reviewed referred uniquely to identity capital so it was difficult to incorporate this type into their model as a distinct factor. The resulting model identified five explanatory mechanisms:

> According to our review of empirical studies, adult learning seems to increase the likelihood of civic participation by (1) generating the economic preconditions of civic participation; (2) increasing individual qualifications for civic participation and its perceived benefits; (3) strengthening relevant low-level personality trait characteristics; (4) generating related values and attitudes; and (5) expanding networks and providing access to new communities (Rüber, et. al, 2018, p.557).

(Rüber, et. al, 2018) described these mechanisms by conceptualizing five paths. First, formal adult learning positively affected one's economic condition which enables a person to afford engaging in unpaid work (volunteerism). This path was conditional to whether or not a formal program of study was completed (i.e., enrollment is not sufficient, a degree or qualification must be earned). Second, all types of adult learning positively affected one's ability to volunteer through the increased knowledge and skills needed to participate. This path was conditional to the content of the adult learning. Third, all adult learning positively affected the low-level personality traits that make a person more likely to volunteer. This path had no conditions. Fourth, all adult learning increased volunteerism because of its positive effect on the attitudes and values required to make volunteering a desirable activity. This path was conditional to the content of the learning. And, fifth, formal and nonformal adult learning was viewed as a means of networking among learners, which increased the bonds between individuals and their community and made people more likely to volunteer. This path had no conditions, except that it did not apply to informal learning experiences. As seen, the Rüber model did differentiate between some of the effects of formal versus nonformal adult learning, yet the authors did not consider the unique effects of informal adult learning. Informal learning was only included in the generic "adult learning" component of the model. This absence was a function of the limited analysis of informal learning in the studies their work referenced.

Rüber and Janmaat (2021) used longitudinal data from national surveys conducted in the United Kingdom to explore some components of the Rüber et al. (2018) model. As that model theorized that certain effects of adult learning were conditional to educational content, the authors hypothesized that the subject matter, resulting qualification, and amount of adult education would influence the rate of volunteerism. Their research did show a positive effect of

adult education on volunteerism. In fact, participation in adult education raised the chance that someone would volunteer by close to four percent. However, this effect was not significantly influenced by the content of the learning, whether or not the education resulted in a qualification, or the overall amount of education received. The authors posited that adult education may be influencing the rate of volunteerism through the "expansion of one's social network and . . . the enhancement of one's self-efficacy" (Rüber & Janmaat, 2021, p.66). They also suggested that a limitation of their study was that reversed causality could not be eliminated as the act of volunteering could lead one to engage in adult education.

This study uses confirmatory factor analysis to create latent variables for informal learning, lifelong learning mindset, and civic engagement to create a testable model based on the Rüber et al. (2018) framework. The common indicators of these variables as described in the literature are summarized in the following sections.

Indicators of Informal Learning

The PIAAC's conceptual framework described the rationale for the items included on the background questionnaire, emphasizing the importance of not only looking at "the incidence of formal training" but also "various kinds of informal learning, as these contribute highly to skills acquisition" (OECD, 2009, p. 23). Furthermore, the survey designers acknowledged there are "factors outside the world of work that can affect the development and retention of competences," which is why they included questions that relate to everyday activities from which learning is possible" (OECD, 2009. p. 25). This study used a subset of these survey items as indicators of informal learning. A review of other studies measuring informal learning was used to strengthen the case for including certain items as informal learning indicators.

Derrick (2003) characterized informal learning as learning which happens in everyday life focused on four factors: initiative, resourcefulness, persistence, and motivation to learn. Derrick (2003) asserted that this type of autonomous learning is vital to the lifelong learning process and that it is possible to assess this construct by identifying behaviors measured by the capacity of one's "intention to learn" (p. 5). The author presented a model to explain how when learners "endure" in their activities, the four factors become reciprocal processes that "ultimately determine the state of the learner" (p. 14). This research is a possible explanation for how informal learning may lead to some common attributes of lifelong learning mindset (self-efficacy, initiative, resourcefulness, and persistence) and how that mindset fosters improvements in both individuals and society.

Sulkunen et al. (2021) used data from the 2012 PIAAC to analyze the effect of informal learning (reading activities both at work and outside of work) on literacy skill. In support of the study's purpose, the authors state, "literacy is one of the key competencies needed for lifelong learning; it is a significant component of personal development . . . social inclusion and active citizenship" (p. 207). This belief is one of the underlying assumptions of the PIAAC and the learning city framework. They found that the effect of everyday reading activities done outside of work was more strongly related to literacy proficiency than reading done at work. The frequency of informal reading activities, especially those done outside of work, had a significant effect on literacy scores on the PIAAC. This effect was independent of highest level of formal education. However, overall, initial formal education and occupation were better predictors of literacy skills. In fact, these types of background variables accounted for most of the variance in skill level. Both types of informal reading combined with the incidence of formal/nonformal training activities added just 2% more explanation to the study model, with reading outside of

work accounting for 1.9% of that two percent. The authors used many of the same indicators used in the current study (reading directions or instructions; articles in newspapers, magazines, or memos; and letters or email), yet included additional indicators not in the current study, such as reading professional journals, books, reference manuals, and maps or diagrams. One item the current study categorized as a numeracy-related indicator, "reading bills, invoices, or bank statements," was used as a reading activity in the Sulkunen study. It is important to note that this study only used the everyday activities related to reading, while the current study also included writing activities.

Lai et al. (2011) surveyed Taiwanese adults using six questions developed by the U.S. National Center for Education Statistics (NCES) to measure informal learning. Five of these questions related to activities outside of the workplace: reading informative books/magazines and using the Internet for learning (both also questions on the PIAAC), and watching educational television, listening to instructional radio, and participating in educational trips (which are not items on the PIAAC). Using these items as indicators of informal learning, the survey indicated that the majority of adults did some form of informal learning. It is interesting that the PIAAC does not include television watching on its background questionnaire as it was the indicator with the highest participation. However, reading books/magazines and using the Internet both had high levels of frequency (44.73% and 42.14% respectively). While this study was conducted with Taiwanese adults, it demonstrated the generalizability of certain informal learning activities as the survey questions were based on the NCES National Household Survey and were still valid with an Asian population.

Desjardins (2020) found that higher rates of informal learning correlated positively with higher participation in formal and nonformal education. While the data also showed that workers

with lower levels of education tended to have fewer chances of receiving organized forms of training, the effects of informal learning could not be discounted. When the amount of time spent reading on the job was taken into consideration, the rate of participation in nonformal learning also increased. Desjardins (2020) described the "the daily processing of information, especially the reading of different types of text-based materials either in print or digital formats" as a "particularly potent type of informal learning" in the creation of knowledge societies" (p. 33).

Cerasoli et al. (2018) framed the construct of informal learner behaviors as having antecedents (personal factors and situational factors) and outcomes (attitudes, knowledge and skill acquisition, and performance). They defined informal learning behaviors as "non-curricular" and "highly experiential" where learning "does not have a designated/assigned set of knowledge and skills to be mastered" (p. 204). Some of the antecedents to informal learning they identified are individual traits that predispose one to learning, and demographic characteristics. This assumption reverses the hypothesized relationship in the current study which predicted that informal learning activities influence personal traits (lifelong learning mindset). However, Cerasoli et al. (2018) demonstrated that informal learning behaviors influence outcomes, such as attitudes and performance, as participators in informal learning behaviors achieve 32% higher performance than non-participators. The current study treated LLM more as an attitudinal outcome that affects performance rather than a uniquely personal trait.

One challenge to using everyday activities to measure informal learning comes from Pesen and Epçaçan (2017) who insisted that lifelong learning must be intentional and not something that happens "automatically with daily life" (p. 26). Their studies were based on intentional learning that occurs throughout the lifespan that has four main components: it must be intentional, the student must be aware; the learning has defined objectives that are not too

general, such as “improve the mind”; learners must take responsibility for their learning or lack of learning; and students intend to remember and use what they have learned for more than a fleeting moment. These components are contrary to what the current study has defined as the “already existing learning city” and the definition of common everyday informal learning activities as lifelong learning. These authors also rejected the notion of lifelong learning as only occurring in adults because they believed it begins at birth.

Because the PIAAC background questionnaire only asks respondents about the frequency of their activities and not their reasons (for example, “How often do you read the newspaper?” versus “Why do you read the newspaper?”), it is impossible to determine if the informal learning activities measured by the PIAAC are intentional learning. The current study did not restrict the definition of informal learning to intentional learning only; however, it acknowledged that the activities themselves are intentional as no one reads the newspaper “by accident.”

Indicators of Lifelong Learning Mindset

Mezirow viewed the process of transformative learning as “a metacognitive application of critical thinking that transforms an acquired frame of reference—a mind-set or worldview of orienting assumptions and expectations involving values, beliefs, and concepts” (Dirkx et al., 2006, p. 124). This study used data from the PIAAC to create a latent variable for lifelong learning mindset (LLM). While several items on the background questionnaire are intended to measure participants’ meta-cognition and grit (OECD, 2009), the PIAAC itself is not an instrument specifically designed to measure lifelong learning mindset. Liu et al. (2019) used two questions from the learning strategies section of the PIAAC’s background questionnaire to examine the relationship between self-directedness and lifelong learning but did not attempt to use the PIAAC as a measure of lifelong learning mindset for the population in the sample.

Instruments such as the Lifelong Learning Trends Scale (Gür Erdogan and Arsa, 2015) have segmented lifelong learning into more than one factor, unlike the PIAAC's single section of questions related to learning strategies.

A review of the literature on measuring lifelong learning mindset (also called lifelong learning tendency or simply lifelong learning) found eight distinct instruments that have been used in previous research. Table 2.1 summarizes the eight instruments.

Table 2.1

Summary of Lifelong Learning Mindset Instruments

Instrument	Indicators	Validity
Effective Lifelong Learning Inventory (ELLI) (Deakin Crick & Yu, 2008)	72 items; seven dispositions (changing and learning, critical curiosity, meaning making, dependence and fragility, creativity, learning relationships, and strategic awareness)	All Cronbach alpha values remained above 0.7 when tested with multiple age groups making this instrument suitable for adults across the lifespan; used in schools and universities in the United Kingdom
Lifelong Learning Tendency Scale (Coşkun & Demirel, 2010)	27 items; four factors on two dimensions: motivation and perseverance (positive aspect) and lack of regulating learning and lack of curiosity (negative aspect); rate items on a 5-point agreeability scale	Used in at least 14 studies on LLT, primarily in Turkey with college students and teachers; Cronbach alpha was 0.89
Generic Lifelong Learning Scale (Kirby et al., 2010)	14 items; one factor; rate items on an agreeability scale	Used with college students in Canada; Cronback alpha ranged from 0.77 to 0.83
WielkLLS (Wielkiewicz & Meuwissen, 2014).	16 items, one construct (lifelong learning); rate items on a 5-point frequency scale	Used in at least 2 studies on lifelong learning with students and employed adults; validated with college students in the U.S.; Cronbach alpha ranged from 0.84 to 0.88
Lifelong Learning Tendencies Scale (LLTS) (Gür-Erdogan & Arsal,	17 items; two factors (willingness to learn and openness to improvement);	Used in at least 3 studies on LLT, primarily in Turkey with college students and

2015)		teachers; Cronback alpha was 0.86
Effect of the University Education on Lifelong Learning Tendency Scale (Tezer & Aynas, 2018)	33 items; three dimensions (individual development, education received, sparing time)	Validated with student teachers and employed teachers in Turkey; Cronbach alpha was 0.91
Yaman Lifelong Learning Tendency Scale (Şentürk, 2019)	One factor evaluated with a 5-point Likert-type scale	Used with student teachers in Turkey; Cronback alpha was 0.91
Lifelong Learning Mindset Questionnaire (Drewery et al., 2020)	Eight items; two factors (resilience and strategic thinking	Validated with mostly middle-age or older workers in Canada; Cronbach alpha was 0.76

In 2008, Deakin Crick and Yu evaluated the *Effective lifelong learning inventory* (ELLI) and found it to have consistent reliability. The instrument measures seven dispositions (changing and learning, critical curiosity, meaning making, dependence and fragility, creativity, learning relationships, and strategic awareness) that are reflective of one's "learning journey" (Deakin Crick & Yu, 2008, p. 389). These are traits and attitudes that are realized in individuals who are successful at intentional learning. The ELLI consists of a 72-item self-reported questionnaire. These items originated with Deakin Crick et al. (2004). The dispositions "critical curiosity" (a desire to get to the bottom of things) and "meaning making" (looking for links between new knowledge and what is already known) most closely relate to the learning strategies questions on the PIAAC. Also similar to the PIAAC background survey, the ELLI measures "what people say about themselves at a particular point in time" (Deakin Crick & Yu, 2008, p. 400). All Cronbach alpha values remained above 0.7 when tested with multiple age groups making this instrument suitable for adults across the lifespan.

Of the studies reviewed, the most widely applied instrument was the Coşkun and Demirel (2010) Lifelong Learning Tendency Scale (LLTS), which was used in 14 studies. The 27-item LLTS 27 was grouped into four factors on two dimensions: motivation and perseverance (the

positive aspect) and lack of regulating learning and lack of curiosity (the negative aspect). The authors defined lifelong learning as the "voluntary and self-motivated pursuit of knowledge for either personal or professional reasons" with the ability to "enhance . . . active citizenship" among its many benefits (Coşkun &Demirel, 2010, p. 2343). This definition supports informal learning as a source of LLT and LLT as an influence on civic engagement. The items on the LLTS are based on a review of the literature, and its construct validity was tested by comparing it with Erwin's (1998) Curiosity Index. Users self-reported their answers on a five-point Likert-type scale. The Cronbach alpha internal consistency was 0.89 which indicated high reliability. The LLTS has been used to measure LLT in relation to other factors such as self-efficacy (Akyol, 2016), quality of life (Beytekin & Kadi, 2014), motivation (Yilmaz & Kaygin, 2018; Chukwuedo et al., 2021), educational philosophies (Kaygin et al., 2017), emotional regulation (Orhan-Karsak & Yurtçu, 2021), Facebook usage (Haseski et al., 2014), the search for the meaning of life (Kilinç & Uzun, 2020), and professional affiliation (Aksoy et al., 2017; Demir-Basaran & Sesli, 2019; Kaya, 2020; Yağan, 2020). When using the LLTS, researchers frequently reported that the LLT of females is significantly higher than that of males (Kilinç & Uzun, 2020; Yağan, 2020; Pesen & Epçaçan, 2017; Aksoy et al., 2017; Demir-Basaran & Sesli, 2019), while Beytekin and Kadi (2014) found the reverse, and Kaya (2020) reported no significant difference based on gender. Using the Coşkun and Demirel (2010) lifelong learning tendency scale (LLTS), Yilmaz and Kaygin (2018) found a low, positive correlation between LLT and achievement motivation, but achievement motivation was a poor predictor of LLT as it only explained 4.3% of the variance. The authors concluded that it was difficult to separate motivation and LLT into separate constructs because they may be too related to each other.

The Kirby et al. (2010) "generic lifelong-learning scale" was developed the same year as the Coşkun and Demirel (2010) LLTS. This instrument is a 14-item scale with one factor. It is a self-report instrument with questions based on the theoretical work of Candy et al. (1994) and Knapper and Cropley (2000). One item in this instrument is almost identical to one of the PIAAC learning strategies questions: "When I approach new material, I try to relate it to what I already know" (Kirby et al., 2010, p. 297). One of the challenges of measuring lifelong learning that Kirby et al. sought to address was to validate the importance of informal learning and studying learning as a human activity through quantitative methods. The authors described their instrument as based on the construct of lifelong education first promoted in UNESCO's Faure report (p. 293). While the Effective Lifelong Learning Inventory (ELLI) is mentioned as an influence (Deakin Crick & Yu, 2008), Kirby et al. critiqued the ELLI as not addressing the "setting of personal and realistic learning goals, the application of existing knowledge and skills, the self-evaluation of learning, or the location of information from different sources" (p. 293). They believed that more attention should be placed on the cognitive aspects of lifelong learning tendency and asserted that by focusing only on adults, their instrument would be less prone to error. This tool was validated by comparing the measure of lifelong learning with approach to learning (deep and surface). While Knapper and Cropley (2000) identified five characteristics of lifelong learners and the items on this instrument were based on their categories, the data best fit the one-factor model, and so it was retained for this scale. Kirby et al. (2010) admitted that other factors outside of their scale may influence lifelong learning tendency such as other "cognitive, affective, and experiential," but their focus on specific strategies likely influenced their scale's one-factor result (p. 299). The authors also found no difference between participant scores based

on age and concluded that lifelong learning tendency is probably a result of "early-established traits and later-occurring situational factors" (p. 301).

The next most frequently used instrument was the Gür-Erdogan and Arsal (2015) Lifelong Learning Tendencies Scale, which appeared in three studies. This LLTS is a 17-item scale with two factors: willingness to learn and openness to improvement. The scale evaluates tendency "trends" rather than skills because the authors asserted that trends better reflect the affective dimension, and mindset is more affective than cognitive in nature. The Gür-Erdogan and Arsal scale was first developed to measure lifelong learning trends in preservice teachers, and was modeled on the scales developed by Kirby et al. (2010) and Coskun and Demirel (2010). This instrument has been used to analyze information literacy and self-efficacy as predictors of LLT (Kozikoglu & Onur, 2019), to explore the relationship between LLT and social entrepreneurship (Sezen-Gultekin & Gür Erdogan, 2016), and to examine the mediator role of LLT between motivation for success and personal-professional competence (Ekşi et al., 2020). An English translation of the original Turkish items that are comparable to the learning strategies questions used in the PIAAC is shown in table 2.2.

Table 2.2

Gür-Erdogan and Arsal (2015) Lifelong Learning Tendencies Scale – English Translation

Item	Similar to LS Items on the PIAAC
I set learning goals appropriate to my own competencies.	
I prepare the necessary resources for learning in advance.	
Using a learning strategy appropriate to the learning topic, I believe it is necessary.	
Working to make good use of time in the learning process I make the plan.	
That I can learn when I encounter new information I trust myself.	LS 6 (When I come across something new, I try to relate it to what I already know.)

I prefer to motivate myself in the learning process I do.	LS 1 (I like learning new things.)
Avoid trying to learn even if the learning topics are difficult I don't give up.	LS 3 (I like to get to the bottom of difficult things.)
I enjoy learning new things.	LS 1 (I like learning new things.)
Help when I need it in the learning process I'm not afraid to ask.	LS 4 (If I don't understand something, I look for additional information to make it clearer.)
It is my own responsibility to learn a subject I believe.	
Learning new things helps me improve myself I think it provides.	
The internet made me know different cultures I think.	
Necessary for my personal or professional development I would like to receive training on knowledge and skills in the fields.	
Due to rapid changes in information and technologies I need constant learning to renew my knowledge I hear.	
To solve problems that I may encounter in my profession I make an effort.	LS 3 (I like to get to the bottom of difficult things.)
Receiving training to overcome my professional inadequacies I look for ways.	
I give importance to progress in professional career.	

Note: Items are literal translations from Turkish generated using Google Translate

Another tool that has been validated to measure an adult's "tendency to practice lifelong learning" is the WielkLLS (Wielkiewicz & Meuwissen, 2014, p. 220). This scale was designed to ask questions that could apply to students and employed adults so that it could be used in diverse settings across age groups. The authors described lifelong learning as a "habit of mind" (p. 220). Although Wielkiewicz and Meuwissen did not discuss learning cities in their work, they do quote substantially from Longworth (2006) a foundational author on the subject of learning cities. They concurred with Longworth's assertion that lifelong learning is integral to positive civic outcomes in a society. Wielkiewicz and Meuwissen (2014) described a person who has a

high lifelong learning score (LLS) as one who "engage[s] in behaviors and activities such as reading, thinking, writing, and discussion that tend to engage them in critical thinking about issues and problems in their personal lives and the broader community" (p.221). They also suggested that people with higher LLS scores "should be better prepared to deal with adaptive challenges in their lives and those confronting society" (p. 221). One benefit of measuring LLS is that unlike "hard skills" such as literacy, numeracy, and critical thinking, lifelong learning tendency measures some soft skills that are important in determining success in the workplace such as creativity and motivation to learn (Cordie et al., 2021). Wielkiewicz and Meuwissen's (2014) scale, the WielkLLS is a 16-item questionnaire focused on one core construct (lifelong learning). Participants rated each item on a 5 point frequency scale ranging from one (never) to five (always or daily). Five of the items are related to reading. In fact, the authors stated that they expected lifelong learning "to be characteristic of voracious readers" because it is the "primary way for individuals to acquire new knowledge" and reading would be an expected, typical activity of a lifelong learner (p. 225). While the authors acknowledged that daily activities likely influence LLT, their study did not examine what these activities are, leaving this an area open to further research. One item (I like to learn new things) is an exact match with one of the PIAAC learning strategies questions.

Based on the belief that graduates of universities will need to continue learning throughout their lives to be successful, Tezer and Aynas (2018) investigated the effect of a university education on LLT. To measure this effect, the authors used a sample that included both student teachers and graduates currently employed as teachers. The researchers developed their own survey instrument, the "effect of the university education on lifelong learning tendency scale" to measure LLT. This scale consisted of 33 items with three sub-dimensions: individual

development, education received, and sparing [sic] time. The results showed that university education did have a significant positive effect on LLT, yet the level of LLT was higher in the current teachers than in student teachers. The researchers theorized that current teachers have had more exposure and need for lifelong learning than students so this may be a reason for the difference. Like other studies on LLT using other instruments, Tezer and Aynas (2018) found a significant difference in LLT based on gender (females tended to have higher LLT). Age, on the other hand, did not have a significant effect on LLT.

The only instrument to define the lifelong learning construct as a mindset was Drewery et al. (2020), which stated lifelong learning mindset is "a way of approaching one's work with curiosity, strategic thinking, and resilience" (p. 567). These three components: epistemic curiosity (the drive to learn new things based on the tension created by not understanding); strategic thinking (learning that is goal-based and intentional); and resilience (the will to not give up), form a "suite of beliefs, attitudes, and tendencies displayed by lifelong learners" (Drewery et al., 2020, p. 569). The authors related a person's success at work to the success of the entire organization, which can equate to the success of citizens and their impact on a community. This study used an eight-item self report of LLM that was designed by the researchers based on several existing questionnaires. The data produced a two-factor solution (resilience and strategic thinking). One item "In trying to understand new ideas at work, I try to relate them to real life situations to which they might apply" (Drewery et al., 2020, p. 571) is almost identical to one of the learning strategies questions on the PIAAC. The results showed that LLM was positively correlated with supervisor-rated performance. It was also a significant predictor of the number of promotions, job satisfaction, and work engagement. The population in this study also differed from many of the others in that it was North American (Canadian) and included a substantial

number of middle-aged or older workers. The authors acknowledged that their study was "limited" because it did not use a previously validated instrument to measure LLM. They questioned the extent to which formal education alone was responsible for the effect of LLM that they found or whether the effects of informal learning might also play a role on LLM.

One additional instrument cited in the literature was the Yaman (2014) Lifelong Learning Tendency Scale. This scale was used by Şentürk (2019) to evaluate the relationship between LLT and technological pedagogical content knowledge (TPACK) of student teachers. TPACK is a measure of how well teachers are able to integrate technology into their teaching. Because technology is continually evolving, it is thought that teachers who know how to apply technology might also be inclined to have high lifelong learning tendencies. Contrary to other studies of LLT, Şentürk (2019) did not find any significant difference in LLT based on gender. However, the LLT student teachers did vary significantly by content area. Pre-service teachers in the social sciences and counseling had higher LLT scores than the others, while pre-school teachers and Turkish teachers had the lowest. There was a moderate, significant correlation between LLT and TPACK, which provided evidence that technology use as an everyday activity may have a positive effect on lifelong learning mindset.

Indicators of Civic Engagement

Jennings and Zeitner (2003) defined civic engagement as a broad range of behaviors and attitudes, which included 14 measures in four clusters: media attentiveness (which included reading the newspaper and magazines), political involvement (which included political self-efficacy), volunteerism, and trust orientation (which included social trust). They found that of surveys used to measure civic engagement:

> One weakness lies in their focus on a limited number of civic engagement indicators, which can lead to misplaced generalizations. What is true for political attentiveness, for example, might not be true for voluntary organization activities. What is true for the relatively easy act of voting may not hold for the more demanding one of contacting public officials. Limited indicators provide a questionable basis for generalization" (Jennings & Zeitner, 2003, p. 313).

Doolittle and Faul (2013) developed the Civic Engagement Scale (CES), a 14-item, two-factor (Attitude and Behavior) instrument. The purpose of the CES is to measure the civic attitudes (personal beliefs and self-efficacy) and behaviors (actions taken) of students who have engaged in a service learning experience. Survey items for attitudes are rated on a seven-point scale of agreeability and items for behavior are rated on a seven-point scale of frequency. The CES is similar in composition to the civic engagement questions on the PIAAC background survey which also measures behavior (frequency of volunteerism) and attitudes (political self-efficacy and social trust). However, the PIAAC only asks four questions and uses a five-point scale. Another difference between the CES and the PIAAC is that the CES asks about volunteerism as both an attitude: "I believe that it is important to volunteer," and a behavior: "I am involved in structured volunteer position(s) in the community" (Doolittle & Faul, 2013, p. 4).

Talo and Mannarini (2015) developed the Participatory Behaviors Scale (PBS), a 28-item, four factor (disengagement, civil participation, formal political participation, activism) instrument. Each factor has between six and eight indicators. One of the indicators under the civil participation factor is "Volunteers in social/civic/religious organization" (p. 806). The disengagement factor is used to measure non-participation. For example, one of its indicators is "Does not read newspapers or watch TV programs that address political issues" (p. 806). The

authors also developed a 16-item PBS "short version" that limited each factor to four indicators and had better global fit when analyzed using confirmatory factor analysis (CFA). When testing the instrument on multiple samples, the authors found that engagement is not necessarily the opposite of disengagement. They posited that disengagement may be a form of active participation as it represents a valid choice for citizens (the choice to intentionally not be involved).

Campagna et al. (2020) preferred the term "civic participation" which they described as "The behaviours [sic] and attitudes through which people express their willingness of interacting within the community and contributing to its well-being, as far as four dimensions are concerned: Political life, Civil society, Community life and Civic sense" (p. 662). The authors used this definition to construct a composite "civic life" indicator they tested with data from a national survey conducted in Italy.

Current research in civic engagement demonstrates that a transformed view of what the construct means may be necessary. Oser (2017) sought to find trends in how citizenship norms are changing and the effect of those changes on civic engagement. The study used data from the U.S. Citizen Involvement and Democracy survey and latent class analysis to identify four types of participators. The smallest group was called the "all-around activists" (those who are the most likely to engage in all types of political action from voting to protesting). The next smallest group identified was the "high-voting engaged," who were likely to vote, sign petitions, participate in boycotts, and use the Internet for political action, but were not likely to participate in political campaigns or party activities. They had an average tendency to engage in protests. The next-to-largest group was the "mainstream participants" who earned that name because their engagement patterns were generally reflective of the study sample's means for each type of

political activity. The largest group (60% of the sample) was named "disengaged." This group had low probabilities of participation in any of the types of political activity in the survey. Although some members of this group did vote, it was in lower numbers than in any of the other groups. The PIAAC does not ask questions about the types of political activity analyzed in the Oser study; however, similar levels of "disengagement" can be seen when reading the code book that summarizes the frequency and mean for each item on the background survey. This comparison is noteworthy because Oser (2017) suggested that special attention should be given to the disengaged group to better understand the nuances within this type, especially if one wants to determine which behaviors of this group are potential assets versus threats to democracy.

Relationships Among Informal Learning, Lifelong Learning Mindset, and Civic Engagement

This section presents an overview of the relationships between this study's latent variables (informal learning, lifelong learning mindset, and civic engagement) to lay the theoretical foundation for the structural regression model specified in the next chapter.

Demir-Basaran and Sesli (2019) believed that most lifelong learning (LLL) is typically informal because it takes place in adulthood after the formal, childhood education process is done. Lifelong Learning Tendency (LLT) can be identified by looking at characteristics of the LLL and lifelong learners: totality (all types of learning in all places by all people); integration (the overlap of home and social life into learning); flexibility (LLL's adaptation to changing needs and resources); democratization (how everyone can benefit); and self-fulfillment (the path to self-actualization and most important goal). They stated that a "large number of direct and indirect factors [affect] the lifelong learner" (p. 731). Their study showed that the frequency of reading books, magazines, and newspapers did not have a significant effect on the LLT of

teachers in their sample. This result contradicted other studies, such as Desjardins (2020) who found that reading-related activities did impact traits related to building a knowledge society. The authors suggested that the low level of LLT in general of the participants in the study may have been the reason for the low frequency of reading (or why reading did not have a significant impact).

Cummins and Kunkel (2015) found that workers in the U.S. with less (formal) education are also less likely to have access to and participate in lifelong learning when compared with workers with college degrees. The U.S. is a leader in income inequality among OECD countries (Cummins & Kunkel, 2015). OECD data showed that the U.S. is below average in the number of hours people participate in job-related nonformal training over their lifespan, but above average in the number of older adults participating in education-related activities.

Kozikoglu and Onur (2019) found that information literacy level (one's ability to use information tools in everyday life to solve problems) predicted 32.7% of LLT. They concluded that "information literacy is an important and necessary skill in acquiring lifelong learning habits and in developing lifelong learning tendencies" (Kozikoglu & Onur, 2019, p. 502). Öteleş (2020) identified a significant positive relationship between LLT and digital literacy with about 16% of the variance in digital literacy explained by LLT. However, this relationship was non-recursive as LLT was also a significant predictor of digital literacy.

Sezen-Gultekin and Gür Erdogan (2016) found a positive, significant relationship between LLT and social entrepreneurship characteristics (self-reliance, personal creativity, and risk taking) which accounted for 57% of the variance in LLT. Collectively, the three factors were significant, but only personal creativity and risk-taking were independently significant. Personal creativity was the strongest indicator of LLT. The authors connected social entrepreneurship to

effecting “social change, creating social value or using . . . resources innovatively in order to satisfy the needs of society” (p.113) which all pertain to civic engagement. They equated the competencies needed for entrepreneurship with those of lifelong learning: active problem solving, creative thinking, self-management, motivation, and perseverance. Kilinç and Uzun (2020) found that LLT is positively and significantly predicted by a student’s “search for meaning in life” and this search explained 21.3% of the variance in LLT. The authors based their research on the belief that “learning is the natural outcome of the sense of curiosity in humans” (p. 89) which leads them to seek out new knowledge and the meaning of it in their lives every day. They related lifelong learning with the learning of everyday life and admitted that formal education systems are inadequate to meet all of a person’s needs for skills enhancement throughout life. As a result of this search for continued meaning, personality development also becomes a lifelong process, which supports the first segment of this study’s structural model: everyday informal learning affects lifelong learning mindset (LLM).

Kaygin et al., (2017) explored the relationship between LLT and educational philosophy: essentialism, perennialism, reconstructionism, and progressivism with essentialism and perennialism being significant predictors of LLT. Reconstructionism had a weak, positive correlation, while progressivism had a weak, negative correlation with LLT. Their study was based on the assumption that the Delors et al. (1996) report’s (a foundational document in learning cities theory) four pillars of lifelong learning are vital to one’s success in society which they believe implies the relationship between LLT and educational philosophy.

Orhan-Karsak and Yurtçu (2021) explored the potential effects of the Covid-19 pandemic on shifting attitudes towards lifelong learning tendency. Specifically, they measured the relationship between student teachers’ study habits outside of the classroom and their emotional

regulation skills on LLT. They found that 30% of the variance in LLT could be attributed to extracurricular study habits and emotion regulation and that those variables were significant predictors of LLT. Their concept of emotional regulation relates individuals' feelings to other people's feelings and emotions, which can also be related to the decision to be civically engaged. The authors recommend training people to achieve better awareness of their emotions as a means of increasing LLT.

Akyol (2016) found that motivation, LLT, and self-efficacy were positively related and that LLT is a full mediator between motivation and self-efficacy. This finding may support LLM as a mediator between informal learning and civic engagement especially in the form of political self-efficacy.

Rather than model civic engagement as an outcome of lifelong learning mindset, Yu et al. (2019) analyzed which factors best predicted learning outcomes for adults in the U.S., Canada, and New Zealand on the PIAAC's three skills assessments (literacy, numeracy, and technology-based problem solving). Cultural engagement (volunteerism), readiness to learn (four of the learning strategies questions), and social trust were found to be the strongest predictors of learning outcomes. Volunteerism was the strongest predictor of learning outcomes in the U.S. and Canada, but the relationship was curvilinear. Yu et al. (2019) hypothesized that "without volunteering in the community, one has fewer opportunities to broaden one's perspective of the world, resulting in a limited learning experience. However, spending too much time in volunteering services could also disrupt one's regular learning schedule" (p. 13). Political self-efficacy was not found to be a strong predictor of learning outcomes.

While not focused on adults, Boyd et al.'s (2011) study determined that adolescents' news media use (including newspaper reading and Internet use) was a reliable predictor of their

civic engagement (through an indirect effect of interpersonal communication with their parents). Their structural model specified four latent factors for civic engagement: civic duty, civic efficacy, neighborhood social connection, and civic participation.

It is interesting to note that when the Internet was still a newer phenomenon, Jennings and Zeitner (2003) conducted a study to investigate the supposed negative effects of Internet use on civic engagement. However, they found that having access to the Internet resulted in greater indication of civic engagement across all categories. Specifically, Internet use had a positive, significant correlation with volunteerism, and had a limited, yet still positive association with social trust.

Rüber and Janmaat (2021) used data from several cycles of the *UK Household Longitudinal Study* to examine the effect of adult education (AE) on civic engagement (CE). The authors measured civic engagement as a binary variable: the presence/absence of volunteer service by an individual. AE was also measured as a binary variable: whether or not an individual participated in some type of training or instruction. AE was further quantified by amount of training, credentialing outcome, and purpose (work-related or non-work related). The data showed that any type of AE had a positive effect on volunteerism. However, none of the categorizations of AE had any significant effect. There was a slight negative effect of work-related education on civic engagement, but it was not statistically significant.

Schoon and Cheng (2011) tested a structural model to evaluate how political trust (attitudes about government and institutions) is affected by lifelong learning, hypothesizing that both early experiences in one's family life and later experiences with institutions will have direct effects on political trust. They found that while cognitive ability and motivation had a direct effect on political trust that lasted into adulthood, there was not a significant direct association

between family social status at birth, highest level of education, or women's employment status and political trust. The data also revealed that women had higher levels of political trust than men to a significant degree, which corresponds to many lifelong learning tendency studies that find females have higher LLT than males. Another gender difference was that the factor most linked with political trust for men was occupational status, while for women it was childhood cognitive ability.

Campagna et al. (2020) explored the relationship between different types of cultural consumption in everyday life (which included the "Press" and engagement with Internet and communication technology) and civic participation. The data revealed that participation in cultural activities was a significant predictor of civic participation even when controlling for education, income, gender, and age. The authors also suggested that higher levels of cultural consumption could compensate for lower levels of formal education in terms of civic participation. This finding supported the current study's connection between informal learning and civic engagement, as well as the important role informal learning can play in learning cities. Campagna et al. (2020) recommend that governments should focus policy on increasing the demand for cultural activities, especially less traditional arts using media and technology to reach new audiences. Given their research, this type of policy could result in increased civic participation and social cohesion.

Gaps in the Literature

A majority of the research on lifelong learning mindset/tendency has occurred outside the U.S. and with college students or teachers as the study population. In fact, the majority of research on LLT and development of instruments to measure LLT has been concentrated in Turkey in university settings. More research is needed on U.S. adults with instruments validated

for North American participants in non-school settings and across occupations. Additionally, little research has explored the effects of numeracy-related informal learning, as most studies used literacy or information communication technology (ICT)-related activities as measures of informal learning.

Summary

This chapter presented an overview of the conceptual and empirical research related to transformative learning theory and learning city theory. It also reviewed previous research that examined the indicator variables and latent variables that were used in building the confirmatory factor analysis and structural regression models in the current study, as well as what is known and not yet known about the relationships among informal learning, lifelong learning mindset, and civic engagement.

CHAPTER 3

METHODS

Introduction

This chapter describes the research methods used to conduct this study. It summarizes the study purpose and research questions. It also provides a rationale for the method based on the literature. Descriptions of the study participants, data collection protocols, and study variables are given to present a context for the methods. Finally, the data collection and data analysis procedures are discussed in depth to draw a clear connection between the methods and results that will be presented in chapter four.

Purpose of the Study

The purpose of this study was to construct a testable model for how everyday informal learning activities, such as reading a newspaper or using the Internet to find more information about issues, may influence one's lifelong learning mindset, as well as how this mindset affects three types of civic engagement: frequency of volunteerism, sense of political self-efficacy, and level of social trust. The intention of this study was to add to the theoretical understanding of how learning cities' promotion of lifelong learning may lead to social change.

Research Questions

This study posed the following research questions and tested seven hypotheses:

1. What latent structure best explains the variability in response patterns related to frequency of everyday informal learning activities?
    a. H1: The eight most common everyday learning activities (ILA) of respondents to the PIAAC are reliable indicators of one latent factor called informal learning (INFLRN).

b. H2: Informal learning can be reliably measured by dividing the eight most common ILAs in the PIAAC into unique indicators assigned to three latent factors (LIT, NUM, and TECH).
c. H2-1: Informal learning can be reliably measured by dividing the eight most common ILAs in the PIAAC into unique indicators assigned to two latent factors (LITECH and NUM).

2. What latent structure best explains the variability in response patterns related to level of agreement with statements related to learning strategy?
    a. H3: The six learning strategies (LS) questions in the PIAAC are reliable indicators of one latent factor called lifelong learning mindset.
    b. H4: Lifelong Learning Mindset can be reliably measured by dividing the six learning strategies questions in the PIAAC into unique indicators assigned to three latent factors (MOTIVE, PERSIST, and SELFDIR).
    c. H5: Lifelong Learning Mindset can be reliably measured by dividing the six learning strategies questions in the PIAAC into unique indicators assigned to two latent factors (MOTPER and SELFDIR).
3. To what extent can civic engagement (CIVENG) be measured through factors related to volunteerism, political self-efficacy, and social trust?
    a. H6: The four civic engagement (CE) questions in the PIAAC are reliable indicators of one latent factor called CIVENG.
4. What is the relationship between informal learning (INFLRN) and lifelong learning mindset (LLM)?

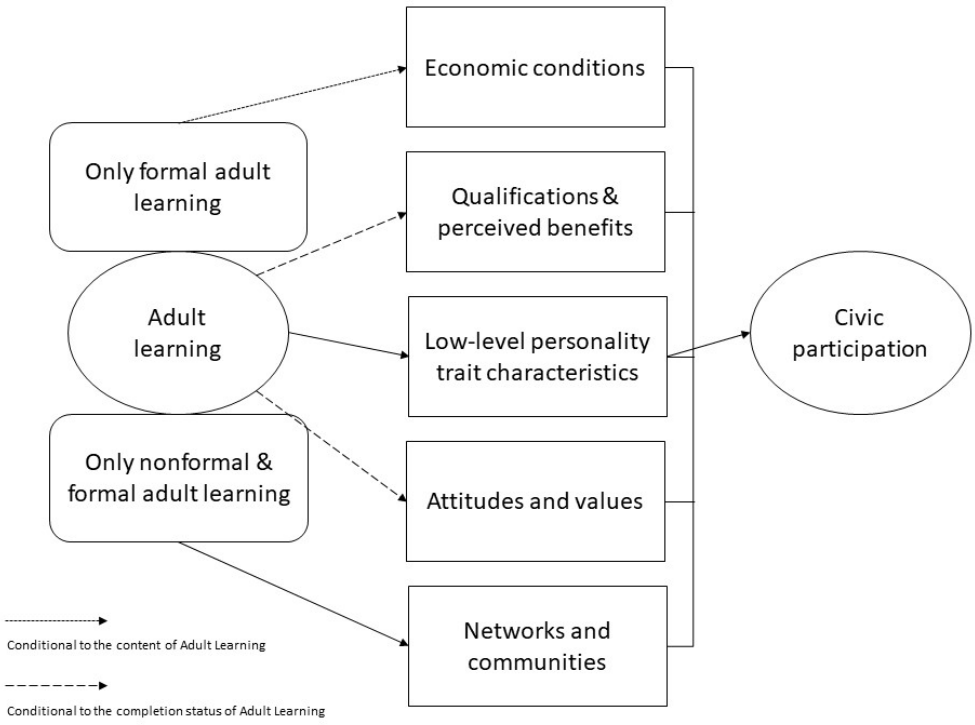
5. What is the relationship between lifelong learning mindset (LLM) and civic engagement (CIVENG)?
6. What is the effect of informal learning (INFLRN) mediated by lifelong learning mindset (LLM) on civic engagement (CIVENG)?

Rationale for Method

This study was informed by a theoretical framework developed by Rüber et. al (2018) that proposed an explanation of how adult learning affects civic participation through various mechanisms (figure 3.1). However, as those authors acknowledged, their "framework in its current form cannot serve as an analytical model" and cautioned that a "researcher will still have to model confounding variables and control for reversed causality" (Rüber et. al, 2018, p. 558).

Figure 3.1

Rüber et. al (2018) Framework for Classifying Mechanisms that Drive the Effect of Adult Learning on Civic Participation



For a detailed explanation of the Rüber framework, see Chapter Two: Literature Review.

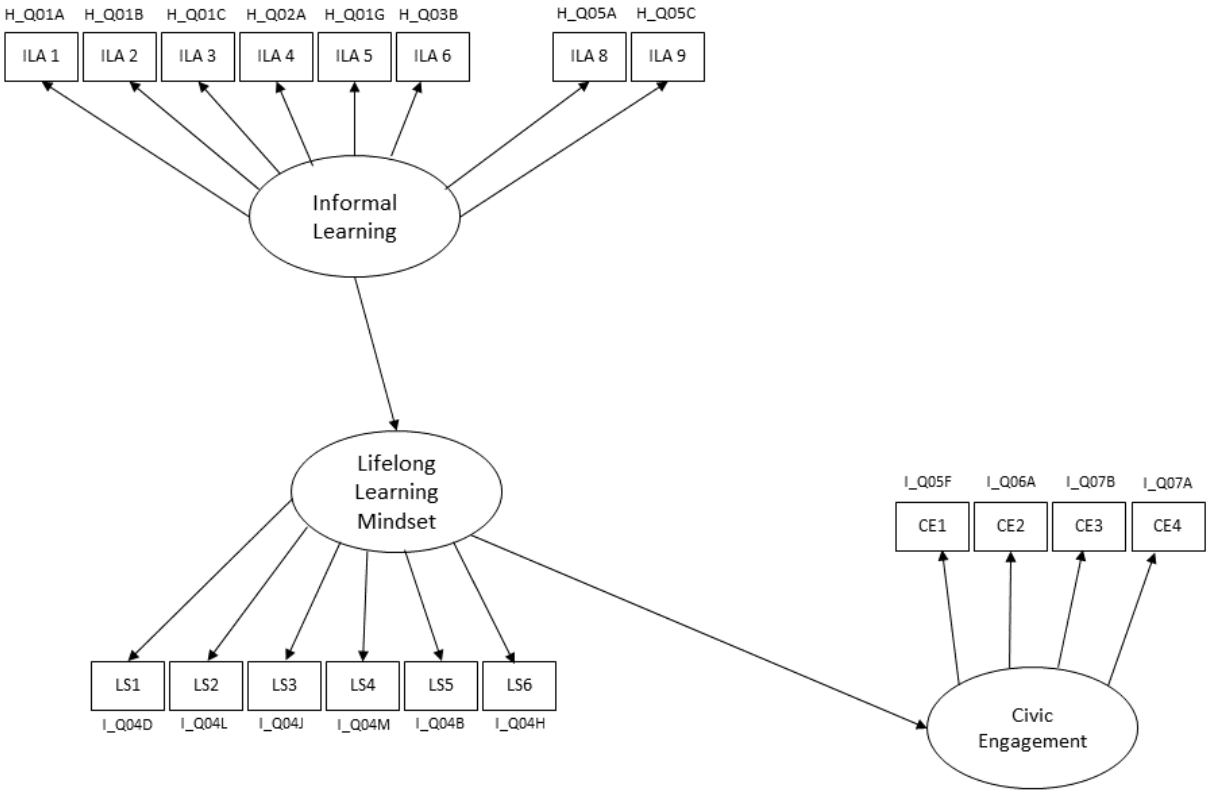
Because the research questions posed in this study required an analysis of causal relationships and the construction of latent variables from observable indicators, I constructed a two-step structural regression model (Kline, 2016). My first task required converting the Rüber model into a two-step structural model that could test my hypotheses and answer my research questions. This process involved identifying variables (both observable and latent) that could measure Rüber et al.'s theoretical constructs. The Rüber model included all three types of adult learning (formal, nonformal, and informal). Since this study only focused on informal learning, I eliminated the paths in the Rüber model that only applied to formal or nonformal learning. I also eliminated two of the paths from "adult learning" that were "conditional to the completion status of adult learning" because everyday skill use does not have a completion status nor does most informal learning. The sole remaining path in the Rüber model that met the requirements of my research questions was adult learning to low-level personality traits to civic participation. I chose to interpret "low-level personality traits" as lifelong learning mindset (LLM) and created a latent variable for LLM using observable personality traits related to learning skills. I also expanded Rüber et al.'s construct for civic participation to include not only volunteerism, but also political efficacy and social trust. While political efficacy and social trust could be identified as "attitudes and values" in the Rüber model, I chose instead to include these variables with volunteerism to create a "civic engagement" variable that is more comprehensive. Rose et al. (2019) used this grouping of variables from the 2012 PIAAC to create a latent variable for civic engagement.

To ensure a sample size large enough for adequate structural equation modeling and one that could be generalized to the U.S. population, I used a secondary dataset, the 2017 Program for International Assessment of Adult Competencies (PIAAC) for the United States. The PIAAC

is a large-scale study guided by the Organization for Economic Cooperation and Development (OECD). The purpose of the PIAAC is to document the knowledge and skills that are necessary for individuals to be productive members of their countries' economies. Participants are assessed for their level of competence in literacy, numeracy, and technology use. Extensive background data are collected on topics such as skills used on the job and in everyday life, years of education, employment status, immigrant status, and civic participation. In the United States, the PIAAC is administered by the National Center for Educational Statistics (NCES) and is a validated, nationally representative sample of U.S. adults. I matched factors in my revised Rüber model with items on the PIAAC background survey. Data from the PIAAC related to "skills use in everyday life" were used to select variables for informal learning activities (ILA); data related to learning strategies were used to select variables for lifelong learning mindset (LLM); and data related to volunteerism, political efficacy, and social trust were used to select variables for civic engagement (CE). Finally, I re-drew the model with the new measures as a fully latent structural regression (figure 3.2).

Figure 3.2

Fully Latent Structural Regression Model Based on Revised Rüber et al. (2018) Framework



Although using the PIAAC data as a secondary source provided the benefit of a large, nationally representative sample for testing the revised Rüber model and helped meet the criteria for structural regression analysis, this dataset posed three challenges for this study. First, the Rüber model is a causal explanation of how adult learning affects civic participation. The *What You Need To Consider before Working with PIAAC Data* guide states, "The data was [sic] derived from non-experimental research, so data should only be analyzed in terms of non-causal

relationships (AIR PIAAC Team, 2019, p. 2). Therefore, making statements about causality using the PIAAC dataset should be done with caution.

Second, in the path of the Rüber model that I retained for my testing, the effect of adult learning on low-level personality traits, is conditional to the content of the learning. The PIAAC measures types of learning activities, such as taking a workshop or seminar or reading newspapers, but there is no indication of the specific content of any of these activities. In the absence of knowing the content of the learning experiences, I chose to contextualize learning based on the type of skills participants used in everyday life. This decision assumed that what the participants learned in the past 12 months was related to the skills they used on a regular basis during the same time period. Furthermore, I set the following selection criterion for an "everyday skill use" to be included in the list of informal learning activities used in this study: the percentage of participants who stated they engaged in the activity at least weekly (those who responded "daily" or "at least once a week") must total 51% or greater of the respondents. This criterion was set to ensure that only informal learning activities done regularly by a majority of the people would be included in the study.

And third, since I had chosen to operationalize civic engagement as volunteerism, political self-efficacy, and social trust similar to the Rose et al. (2019) study that had also used PIAAC data, it was possible that I would not get usable results based on the results of the Rose study. The Rose study used these as individual variables and also attempted to construct a latent variable using observed variables (questionnaire responses) as indicators. The researchers found that the data did not have a good fit [$\chi^2(3) = 2968.52$, $p < .001$; CFI = .458, RMSEA = .31] with their model and they chose not to include the latent variable in their structural model (Rose et al., 2019, p. 28). However, the Rose study used the 2012 PIAAC dataset and included both

American and German responses. This study used the 2017 dataset and only includes American responses.

Participants

The participants in this study (N = 3,660) were the respondents in the 2017 PIAAC study conducted in the United States between March and September 2017. Respondents were selected from a nationally representative sample of U.S. adults aged 16-74 representing the following U.S. Census-defined regions: Northeast (11%), Midwest (30%), South (41%), and West (18%). According to the National Center for Educational Statistics (NCES) which administers the PIAAC in the United States:

> The U.S. sample design employed by PIAAC in the U.S. data collections is generally referred to as a four-stage stratified area probability sample. This method involves the selection of (1) primary sampling units (PSUs) consisting of counties or groups of contiguous counties, (2) secondary sampling units (referred to as segments) consisting of area blocks, (3) dwelling units (DUs) selected from address listings, and (4) eligible persons (the ultimate sampling unit) within DUs. Random selection methods are used at each stage of sampling. This sample design ensured the production of reliable statistics for a minimum of 5,000 completed cases for the first round of data collection.

Gender was almost evenly divided (49% male, 51% female). Sixty-five percent of the respondents were white, 13% were black, 15% were Hispanic, and 9% were other. Almost half of respondents had more than a high school education (48%), while 40% had only a high school education and 12% had less than a high school education. Most respondents were employed (77%) with only 4% unemployed and 19% considered out of the labor force. U.S.-born citizens accounted for 86% of the sample. The demographic distribution of the participants resembles the

population of the United States in several ways. According to the American Community Survey (ACS) conducted by the U.S. Bureau of the Census, the median household income in 2017 was $60,336. The median age was 38 and approximately 33% of U.S. residents had a college degree or higher. The following table summarizes the demographics of PIAAC survey participants (table 3.1).

Table 3.1

2017 PIAAC Respondent Demographics

% by Age	% by Household Income	% by Education
13% 24 or younger	6% $0 - $9,999	11% less than high school
18% 25-34	8% $10,000 - $19,999	43% at least high school or some college
19% 35-44	8% $20,000 - $29,999	41% college degree or higher
17% 45-54	8% $30,000 - $39,999	
22% 55 or older	7% $40,000 - $49,999	
	8% $50,000 - $59,999	
	10% $60,000 - $74,999	
	9% $75,000 - $99,999	
	12% $100,000 - $149,999	
	10% $150,000 or greater	

Protocols

The Organization for Economic Cooperation and Development (OECD) has established the protocols for countries that participate in the PIAAC data collection. These protocols were followed by the NCES which administered the PIAAC in the United States. The PIAAC

background survey was given in both English and Spanish in the United States, while the assessments were given in English only (NCES, n.d.). The background survey is conducted as a face-to-face interview. I submitted my research plan for use of the PIAAC dataset to Auburn University's (IRB). My application was approved on May 13, 2021. See the appendix for full IRB documentation.

Study Variables

All observed variables used in this study were taken from individual survey questions contained within the PIAAC Background Questionnaire. Latent variables were constructed from these observed variables. The following tables (3.2, 3.3, 3.4) describe each variable used in the study.

Table 3.2

Informal Learning Activities Variable Indicators

PIAAC Identifier	Variable Name	Variable Label	Survey Question
H_Q01A	Read directions	ILA1	Read directions or instructions?
H_Q01B	Read letters	ILA2	Read letters, memos, or e-mails?
H_Q01C	Read newspapers	ILA3	Read articles in newspapers, magazines or newsletters?
H_Q01G	Read financial statements	ILA5	Read bills, invoices, bank statements or other financial instruments?
H_Q02A	Write letters	ILA4	Write letters, memos, or e-mails?
H_Q03B	Calculate costs	ILA6	Calculate prices, costs or budgets?
H_Q04B	Use computer outside of work	ILA7	Do you use a computer in your everyday life now outside of work?
H_Q05A	Use email	ILA8	Use e-mail?

H_Q05C	Use the Internet to understand issues	ILA9	Use the internet in order to better understand issues related to, for example, your health or illnesses, financial matters, or environmental issues?

Note: All questions in this section begin with the stem "In everyday life, how often do you usually . . ." and the possible responses are Never, Less than once a month, Less than once a week but at least once a month, At least once a week but not every day, Every day, Don't know, Not stated or inferred, and Refused

Table 3.3

Lifelong Learning Mindset Variable Indicators

PIAAC Identifier	Variable Name	Variable Label	Survey Question
I_Q04B	Relate new ideas into real life	LS1	When I hear or read about new ideas, I try to relate them to real life situations to which they might apply.
I_Q04D	Like learning new things	LS2	I like learning new things.
I_Q04H	Attribute something new	LS3	When I come across something new, I try to relate it to what I already know.
I_Q04J	Get to the bottom of difficult things	LS4	I like to get to the bottom of difficult things.
I_Q04L	Figure out how ideas fit together	LS5	I like to figure out how different ideas fit together.
I_Q04M	Look for additional information	LS6	If I don't understand something, I look for additional information to make it clearer.

Note: All questions in this section begin with the stem “To what extent do the following statements apply to you?” and the possible responses are Not at all, Very little, To some extent, To a high extent, To a very high extent, Don’t know, Not stated or inferred, and Refused.

Table 3.4

Civic Engagement Variable Indicators

PIAAC Identifier	Variable Name	Variable Label	Survey Question
I_Q05F	Volunteer	CE1	In the last 12 months, how often, if at all, did you do voluntary work, including unpaid work for charity, political party, trade union or other non-profit organization?
I_Q06A	Political Efficacy	CE2	To what extent to you agree or disagree with the following statement? People like me don’t have any say about the government does.
I_Q07B	Social Trust1	CE3	To what extent to you agree or disagree with the following statement? If you are not careful, other people will take advantage of you.
I_Q07A	Social Trust2	CE4	To what extent to you agree or disagree with the following statement? There are only a few people you can trust completely.

Note: Potential responses for the volunteer question are Never, Less than once a month, Less than once a week but at least once a month, At least once a week but not every day, Every day, Not stated or inferred, and Refused. Potential responses for the political efficacy and social trust questions are Strongly agree, Agree, Neither agree nor disagree, Disagree, Strongly disagree, Don't know, Not stated or inferred, and Refused.

Data Collection Procedures

Data for this study consisted entirely of secondary data. I accessed the PIAAC Gateway and the National Center for Educational Statistics (NCES) web sites. NCES administers the PIAAC in the United States and maintains the data. I downloaded the public use data file (prgusap1_puf.sav) in SPSS format, and the PIAAC Public Use Data Codebook US 2017 from the NCES website. I used the codebook to select variables from the PIAAC dataset that met the criteria of my structural model.

Data Analysis Description

This study used a two-step structural regression analysis. Kline (2016) recommends this type of structural equation modeling to gain a better understanding of model misspecification in situations where the variables in a structural regression are fully latent. The first step consisted of specifying confirmatory factor analysis (CFA) models (figures 3.3, 3.4, 3.5, 3.6, 3.7, and 3.8) for each of the latent variables (INFLRN, LLM, and CIVENG), testing them for global model fit (table 3.5), and then respecifying a model if indicated based on the model results using model indices and theory to guide the decision of what to respecify. These respecification decisions are explained in detail in chapter five. The models followed Kline's (2016) "rules" for ensuring that standard CFA models are identified. Specifically, if it is a single-factor model, there must be at

least three indicators and if the model has two or more factors, each factor must have at least two indicators.

Table 3.5

Global Fit Statistics and Generally Acceptable Values and Considerations (Kline, 2016)

Statistic	Description	Acceptable Value	Considerations
Chi square	Exact-fit hypothesis (assumes no difference between the model's predicted covariances and the sample's covariances)	Lower (closer to zero)	"Accept-support" test; large p value (above 0.5) is significant
RMSEA	Root Mean Square Error of Approximation ("badness of fit" test)	Zero is perfect (below 0.5 is good; below 0.3 is better)	"Reject-support" test; the 90% confidence interval should not include 0.1; low p value (less than 0.5 is significant)
CFI	Comparative Fit Index ("goodness of fit" test)	1.0 is perfect (at least 0.95 is very good)	A fit of at least 0.90 may be considered sufficient.
TFI	Tucker-Lewis Index ("goodness of fit" test)	1.0 is perfect (at least 0.90 is very good)	The TFI is more conservative than the CFI so acceptable values will be lower.
SRMR	Standardized Root Mean Square Residual; overall difference between observed and predicted correlations ("badness of fit" test)	Zero is perfect (0.06 or less is good)	The correlation residuals matrix should be evaluated in addition to this statistic.

The second step of the two-step structural regression analysis involved using the best fitting CFA model for each latent variable that produced an admissible result in the full structural regression model (figure 3.2). This analysis examined the effect of informal learning on lifelong learning mindset, the effect of lifelong learning mindset on civic engagement, and finally the effect of informal learning on civic engagement mediated by lifelong learning mindset.

In addition to the standard tests of global fit used to determine model acceptance/rejection, model variables were analyzed for local fit when assessing the overall explanatory value of a model. Table 3.6 describes the values used to test local fit and the evaluation parameters. The final interpretation of a model was based on the combination of global and local fit test results balanced with theory from the literature review.

Table 3.6

Local Fit Statistics and Generally Acceptable Values and Considerations (Kline, 2016)

Statistic	Description	Acceptable Value
Standardized Estimate	Correlation of indicator to latent factor	Above 0.7 is best; but lower may be acceptable
Residual Variances	Comparison of estimate with model	Should not exceed 2.0
R-square	The percent of the variance explained by the variable	Higher means it explains more

Data analysis began with a close reading of the codebook. The data file was saved in comma separated delimited (csv) format. SPSS 27 was used to prepare the data and conduct a preliminary analysis of means, standard deviations, and normality. The variables of interest were re-coded into new variables that limited the cases only to those that had a value between one and five. This step was to ensure that only participants who had given a valid answer to the background survey questions used in this study would be included in the dataset. Valid answers for informal learning activity questions and the volunteerism question ranged from “never = 1” to “every day = 5”; learning strategy questions ranged from “not at all = 1” to “to a very high extent = 5”; the remaining civic engagement questions ranged from “strongly disagree = 1” to “strongly agree = 5”. The resulting dataset was exported in csv format and opened in Excel to

prepare it for use in Mplus. This process involved deleting variables outside the scope of this study, deleting cases with missing data (which reduced the number of cases from 3660 to 2830), and deleting the header row labels. It was determined that listwise deletion was an acceptable method of handling cases with missing data and would not have an overly negative impact on the study results due to the large size of the dataset. This version of the file was saved in text tab delimited format.

Mplus 8.5 was used to conduct the confirmatory factor analysis and structural regression testing. There were no missing data as all cases with missing data were deleted prior to importing the data file into Mplus. Although the indicators were coded with numerical values so they could be treated as continuous variables, as Kline (2016) observed, these values are "arbitrary [because] they have no objective numerical or theoretical basis" (p. 257). He further recommended: "Estimation methods for continuous variables are not the best choice when the indicators are Likert-scale items with a relatively small number of categories (e.g. five or fewer) or response distributions are severely asymmetrical" (Kline, 2016, p. 323). For instance, the numerical value assigned to "agree to a high extent" could be five, 10, or even a negative number. The arbitrary nature of the numerical value also renders the means, variances, and covariances less meaningful. The Robust Weighted Least Squares (WLS) estimator was used in this study because the indicators were Likert-type variables that did not have more than five categories, and the responses were not normally distributed. WLS does not make assumptions about how the data are distributed. This dataset (N = 2830) also met the WLS requirement of needing a large sample size (Kline, 2016).

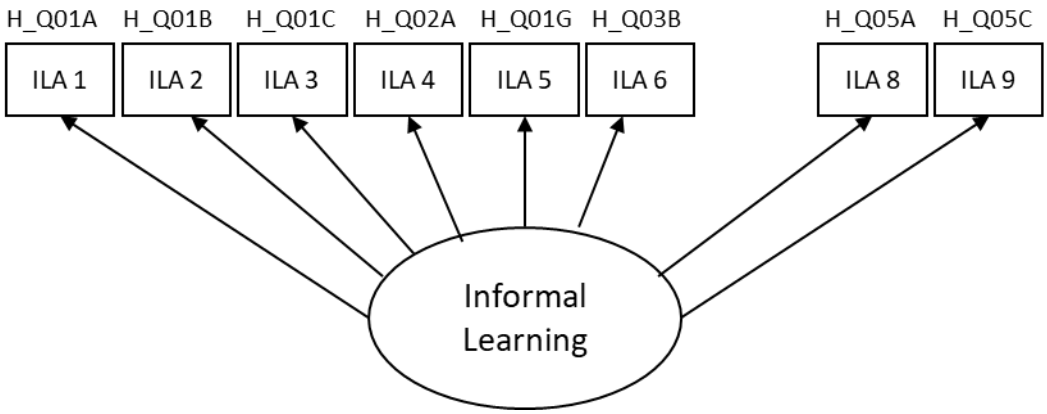
The following models (figures 3.3 through 3.8) were tested to examine the hypotheses identified for each research question in this study. These models were specified prior to entering

the data in Mplus. During the early stage of model testing, it was determined that the variable ILA7 (Use a computer outside of work) was incompatible for inclusion in the model because it was a dichotomous variable (yes/no), and all other variables were measured on a five-point Likert-type scale. This difference resulted in errors so the decision was made to remove ILA7 from the models. It was also discovered that the civic engagement latent variable required another indicator to produce admissible results so both social trust questions were included rather than just one.

H1: The eight most common everyday learning activities (ILA) of respondents to the PIAAC are reliable indicators of one latent factor called informal learning. This model is identified because it is a one-factor model with more than three (eight) indicators.

Figure 3.3

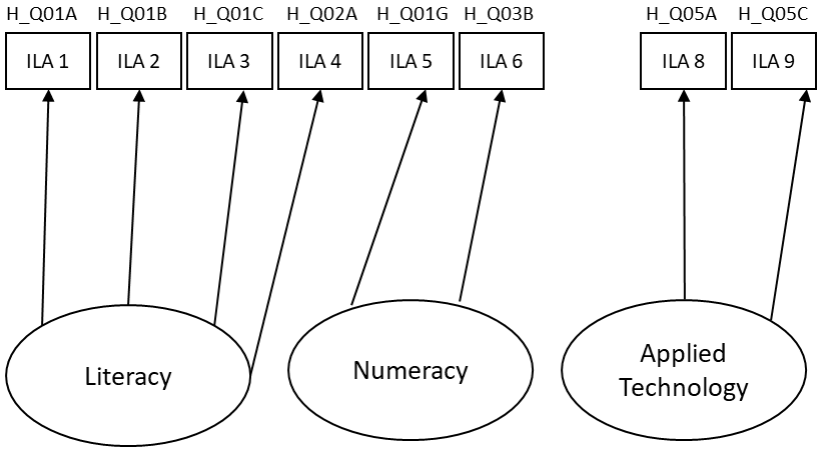
One-Factor CFA Model for Latent Variable Informal Learning



H2: Informal learning can be reliably measured by dividing the eight most common ILAs in the PIAAC into unique indicators assigned to three latent factors (Literacy, Numeracy, and Applied Technology). This model is identified because it is a three-factor model with each factor having at least two indicators (four, two, and two).

Figure 3.4

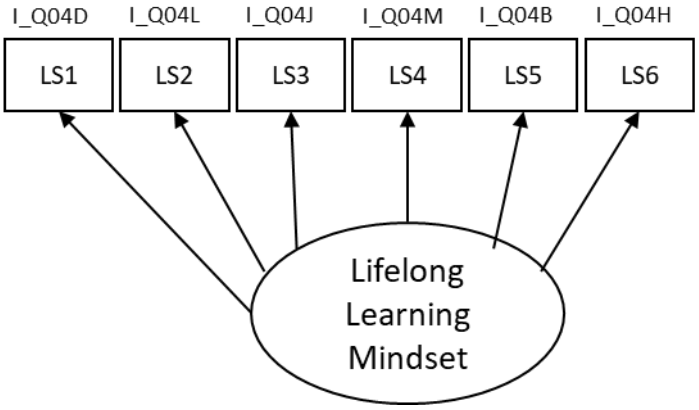
Three-Factor CFA Model for Latent Variable Informal Learning



H3: The six learning strategies (LS) questions in the PIAAC are reliable indicators of one latent factor called lifelong learning mindset. This model is identified because it is a one-factor model with more than three (six) indicators.

Figure 3.5

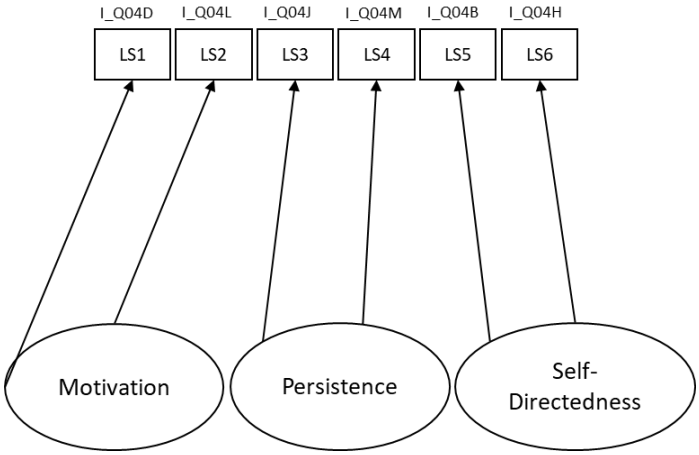
One-Factor CFA Model for Latent Variable Lifelong Learning Mindset



H4: Lifelong Learning Mindset can be reliably measured by dividing the six Learning Strategies questions in the PIAAC into unique indicators assigned to three latent factors (Motivation, Persistence, and Self-Directedness). This model is identified because it is a three-factor model with each factor having at least two indicators (two, two, and two).

Figure 3.6

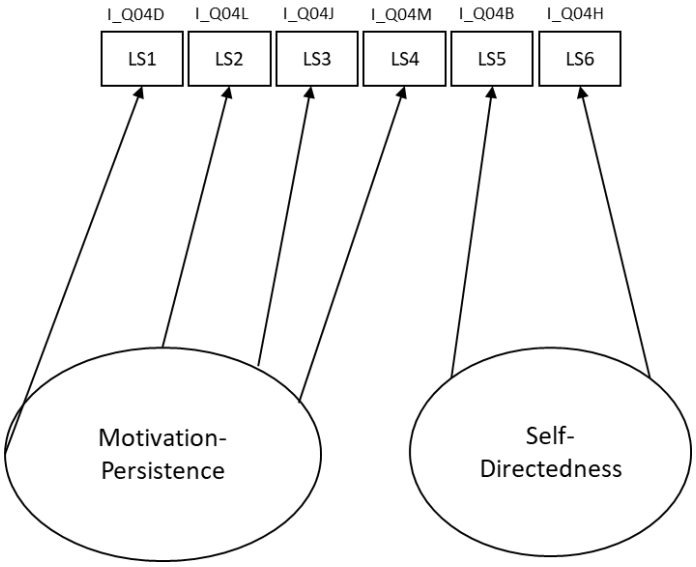
Three-Factor CFA Model for Latent Variable Lifelong Learning Mindset



H5: Lifelong Learning Mindset can be reliably measured by dividing the six Learning Strategies questions in the PIAAC into unique indicators assigned to two latent factors (Motivation-Persistence and Self-Directedness). This model is identified because it is a two-factor model with each factor having at least two indicators (four and two).

Figure 3.7

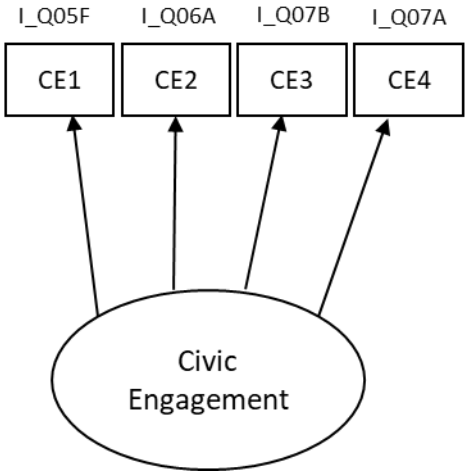
Two-Factor CFA Model for Latent Variable Lifelong Learning Mindset



H6: The four civic engagement (CE) questions in the PIAAC are reliable indicators of one latent factor called civic engagement. This model is identified because it is a one-factor model with more than three (four) indicators.

Figure 3.8

One-Factor CFA Model for Latent Variable Civic Engagement



Summary

This chapter explained the research methods used to conduct this study. It summarized the study purpose and research questions. It also provided a rationale for the method based on the literature. Descriptions of the study participants, data collection protocols, and study variables were given to present a context for the methods. Finally, the data collection and data analysis procedures were discussed in depth to draw a clear connection between the methods and results that will be presented in chapter four.

CHAPTER 4

RESULTS

Introduction

This chapter presents the results of the two-step structural regression model testing that was specified in chapter three. It summarizes the study's purpose and research questions. Descriptive statistics (frequency, mean, variance, correlation, and normality) are provided for the observed study variables. Global fit statistics are given for each tested model that produced admissible results. Local fit statistics for these models are shown in the form of model diagrams which display the standardized estimate (with standard error) for each indicator, as well as the residual variances (with standard error). These results will be interpreted in chapter five.

Purpose of the Study

The purpose of this study was to construct a testable model for how everyday informal learning activities, such as reading a newspaper or using the Internet to find more information about issues, may influence one's lifelong learning mindset, as well as how this mindset affects three types of civic engagement: frequency of volunteerism, sense of political self-efficacy, and level of social trust. The intention of this study was to add to the theoretical understanding of how learning cities' promotion of lifelong learning may lead to social change.

Research Questions

This study posed the following research questions and tested seven hypotheses:

1. What latent structure best explains the variability in response patterns related to frequency of everyday informal learning activities?

a. H1: The eight most common everyday learning activities (ILA) of respondents to the PIAAC are reliable indicators of one latent factor called informal learning (INFLRN).
b. H2: Informal learning can be reliably measured by dividing the eight most common ILAs in the PIAAC into unique indicators assigned to three latent factors (LIT, NUM, and TECH).
c. H2-1: Informal learning can be reliably measured by dividing the eight most common ILAs in the PIAAC into unique indicators assigned to two latent factors (LITECH and NUM).

2. What latent structure best explains the variability in response patterns related to level of agreement with statements related to learning strategy?
   a. H3: The six learning strategies (LS) questions in the PIAAC are reliable indicators of one latent factor called lifelong learning mindset.
   b. H4: Lifelong Learning Mindset can be reliably measured by dividing the six learning strategies questions in the PIAAC into unique indicators assigned to three latent factors (MOTIVE, PERSIST, and SELFDIR).
   c. H5: Lifelong Learning Mindset can be reliably measured by dividing the six learning strategies questions in the PIAAC into unique indicators assigned to two latent factors (MOTPER and SELFDIR).
3. To what extent can civic engagement (CIVENG) be measured through factors related to volunteerism, political self-efficacy, and social trust?
   a. H6: The four civic engagement (CE) questions in the PIAAC are reliable indicators of one latent factor called CIVENG.

4. What is the relationship between informal learning (INFLRN) and lifelong learning mindset (LLM)?
5. What is the relationship between lifelong learning mindset (LLM) and civic engagement (CIVENG)?
6. What is the effect of informal learning (INFLRN) mediated by lifelong learning mindset (LLM) on civic engagement (CIVENG)?

Descriptive Statistics of the Observed Study Variables

Measures of central tendency (mean), frequency, variance, and correlations were tabulated for the 18 observed variables used in this study using both SPSS 27 and Mplus 8.5. Tables 4.1, 4.2, and 4.3 show the frequency (number and percent) of each variable by participant response to the PIAAC Background Questionnaire. Participant responses ranged in value from one to five with one equating to no frequency or no agreement and five equating to high frequency or high agreement.

The most common daily activities reported by participants included two literacy-related skills and both of the technology-related skills in this study: ILA 2 - read letters, memos, or email (77.4%); ILA 8 – use email (74.4%); ILA 9 – use the Internet to better understand issues (53.2%); and ILA 3 – read articles in newspapers, magazines, or newsletters (50.8%). The least common daily activities were related to numeracy skills: ILA 6 – calculate prices, costs, or budgets (22.5%) and ILA 5 – read bills, invoices, bank statements, or other financial instruments (26.2%). The remaining two literacy-related skills fell in the middle with 39.4% responding that they write letters, memos, or emails daily (ILA 4) and 32.1% indicating that they read directions or instructions daily (ILA 1). Because the ILA variables were purposely selected to represent activities that were done by at least half of participants on at least a weekly basis, the percent of

responses indicating that they never engage in a particular activity were low. Not surprisingly, ILA 6, the activity least likely to be done daily, was also the most likely to be done never with 9.3% of participants saying they never calculate prices, costs, or budgets. Active activities, such as calculating prices, appear to be done with less frequency than passive activities, such as using email and reading letters, memos, or emails daily. This difference can be seen when comparing the number of participants who never write letters (7.6%) with those who never read letters (1.8%). Interestingly, reading the newspaper (ILA 3) had one of the higher percentages of participants never doing it (6.2%), while it also had one of the highest percentages of daily frequency (50.8%).

Table 4.1

Frequency of Participant Response for Each ILA Variable

Num/%	1	2	3	4	5
ILA1	158/5.6	397/14.0	533/18.8	837/29.5	910/32.1
ILA2	51/1.8	77/2.7	124/4.4	390/13.8	2193/77.4
ILA3	175/6.2	210/7.4	239/8.4	770/27.2	1441/50.8
ILA4	215/7.6	311/11.0	346/12.2	845/29.8	1117/39.4
ILA5	179/6.3	208/7.3	617/21.8	1088/38.4	742/26.2
ILA6	263/9.3	350/12.3	588/20.7	994/35.1	639/22.5
ILA8	72/2.5	118/4.2	152/5.4	383/13.5	2110/74.4
ILA9	74/2.6	160/5.6	299/10.5	793/28.0	1509/53.2

A majority (50.2%) of participants indicated that the statement “I like to learn new things” (LS 1) related to them “to a very high extent” and almost a majority (47.5%) responded

with the same level of agreement to LS 4 – "If I don't understand something, I look for additional information to make it clearer." Only 20.7% of participants agreed that LS 5 – "When I hear or read about new ideas, I try to relate them to real life situations to which they might apply," related to them to a very high extent. However, the majority of participants responded that all of the learning strategies statements related to them to at least a high extent with even 54.9% of participants expressing this sentiment about LS 5. In fact, one percent or less felt that the learning strategies statements did not apply to them at all (with the exception of LS 5 where 1.7% felt this way). Only 8.7% related "very little" or "not at all" to LS 5 with even fewer participants responding in this manner towards the other variables. Only 1.6% felt that LS 1 related to them "very little" or "not at all." Overall, it appears that a large percentage of participants hold beliefs that are characteristic of a lifelong learning mindset. Similar to the ILA variables, passive statements like "I like to learn new things" were associated with higher levels of agreement than more active statements like "When I hear or read about new ideas, I try to relate them to real life situations to which they might apply."

Table 4.2

Frequency of Participant Response for Each LS Variable

Num/%	1	2	3	4	5
LS1	11/0.4	35/1.2	395/13.9	972/34.3	1422/50.2
LS2	28/1.0	127/4.5	801/28.3	991/35.0	888/31.3
LS3	20/0.7	96/3.4	651/23.0	1016/35.8	1052/37.1
LS4	12/0.4	39/1.4	339/12.0	1098/38.7	1347/47.5
LS5	47/1.7	169/6.0	1061/37.4	969/34.2	588/20.7
LS6	23/0.8	56/2.0	663/23.4	1163/41.0	929/32.8

Compared with the higher frequency of ILA variables and the higher agreement with LS variables among participants, the typical frequency and agreement with CE variables was much lower. For example, only 2.3% of participants volunteered daily, while 41% never volunteered at all and 25.9% less than once a month. Majorities also responded negatively to the two social trust questions with 73.1% stating they strongly agree or agree with "If you are not careful, other people will take advantage of you" (CE 3), while only 12% strongly disagreed or disagreed, and 64.3% responded strongly agree or agree to "There are only a few people you can trust completely" (CE 4), while only 24.2% strongly disagreed or disagreed. The CE 2 variable (People like me don't have a say about what the government does) performed slightly better as 34.4% strongly disagreed or disagreed with that statement and 31.9% strongly agreed or agreed.

Table 4.3

Frequency of Participant Response for Each CE Variable

Num/%	1	2	3	4	5
CE1	1161/41.0	735/25.9	482/17.0	391/13.8	66/2.3
CE2	374/13.2	531/18.7	668/23.6	927/32.7	332/11.7
CE3	775/27.3	1299/45.8	418/14.7	270/9.5	70/2.5
CE4	718/25.3	1105/39.0	327/11.5	533/18.8	152/5.4

Tables 4.4, 4.5, and 4.6 display the means, variances, and correlations for each variable by indicator group (ILA, LS, and CE). Table 4.7 lists the correlation of the ILA variables with the LS and CE variables, and table 4.8 shows the correlation of the LS variables with the CE variables. In the ILA indicator group, ILA 2 had the highest mean (4.623) and ILA 6 had the lowest mean (3.493), which indicates that on average, participants read letters/email close to

daily, while they calculate prices/budgets closer to less than once a week, but at least monthly. Given that most people receive emails daily and that most bills are due monthly, these values are logical. The mean value of ILA 8 (4.532) could also round up to a daily frequency, which makes sense as one would expect a strong association between reading letters/email and using email. In fact, ILA 2 and ILA 8 are the highest correlated variables (0.522). The remaining ILA variables have means indicating weekly frequency (or means that round to weekly), which is also expected given that these study variables were chosen because a majority of participants engaged in them at least weekly. Variances were similar across the variables with most around 1.5; however, ILA 2 and ILA 8 had noticeably smaller variances (0.696 and 0.908) with ILA 9 (use the Internet) also falling in the lower variance group (1.040). Other highly correlated variables were ILA 2 and ILA 4 - write letters/email (0.449), and ILA 4 and ILA 8 (0.474). Moderately correlated variables were the two technology-related indicators ILA 8 and ILA 9 (0.381), and the two numeracy-related indicators ILA 5 and ILA 6 (0.309). Correlations among the literacy-related indicators were mixed. Some were highly correlated, such as ILA 2 and ILA 4 (0.449); some were moderately correlated, such as ILA 2 and ILA 3 (0.327), and some had lower correlations, such as ILA 1 with ILA 3 (0.208) and ILA 1 with ILA 4 (also 0.208). The lowest correlations occurred between ILA 1 - read directions and ILA 5 - read bills (0.109), and between ILA 3 – read newspaper and ILA 6 - calculate prices (0.137). All correlations were positive. In general, indicators within the same group (literacy, numeracy, or technology) were more correlated with each other than with those in other groups with the exception of ILA 2, ILA 4, ILA 8, and to a lesser extent ILA 9. This could imply some overlap between the literacy and applied technology indicators.

Table 4.4

Means, Variances, and Correlations of ILA Indicators

Variable	ILA1	ILA2	ILA3	ILA4	ILA5	ILA6	ILA8	ILA9
Mean	3.686	4.623	4.092	3.825	3.708	3.493	4.532	4.236
Variance	1.471	0.696	1.433	1.606	1.254	1.505	0.908	1.040
ILA1	1.000							
ILA2	0.275	1.000						
ILA3	0.208	0.327	1.000					
ILA4	0.208	0.449	0.257	1.000				
ILA5	0.109	0.187	0.142	0.144	1.000			
ILA6	0.223	0.178	0.137	0.181	0.309	1.000		
ILA8	0.166	0.522	0.246	0.474	0.172	0.179	1.000	
ILA9	0.203	0.237	0.210	0.295	0.170	0.222	0.381	1.000

In the LS indicator group, LS 1 had the highest mean (4.325), closely followed by LS 4 (4.314). These values indicate that, on average, participants agreed to a high extent with the following statements: “I like learning new things” and “If I don’t understand something, I look for additional information to make it clearer.” By contrast, LS 5 – “When I hear or read about new ideas, I try to relate them to real life situations to which they might apply” had the lowest mean (3.663), a value between “to some extent” and “to a high extent.” All of the LS indicators had mean values that indicated agreement “to a high extent” (LS 1, LS 3, LS 4, LS 6) or that could be rounded to that level (LS 2 and LS 5). These values show that participants generally have strong agreement with statements that are characteristic of lifelong learners. The LS

indicators all had variances below 1.000 and which were comparable to each other. LS 4 had the lowest variance (0.589) and LS 5 had the highest (0.857), which was almost identical to LS 2 – "I like to figure out how different ideas fit together" (0.856). All of the LS indicators were at least moderately correlated with many strongly correlated. LS 2 and LS 3 – "I like to get to the bottom of difficult things" were the most highly correlated (0.618), followed by LS 5 and LS 6 – "When I come across something new, I try to relate it to what I already know" (0.570). The least correlated were LS 4 and LS 5 (0.354), and LS 3 and LS 5 (0.355). All correlations were positive.

Table 4.5

Means, Variances, and Correlations of LS Indicators

Variable	LS1	LS2	LS3	LS4	LS5	LS6
Mean	4.325	3.911	4.052	4.314	3.663	4.030
Variance	0.620	0.856	0.797	0.589	0.857	0.714
LS1	1.000					
LS2	0.534	1.000				
LS3	0.441	0.618	1.000			
LS4	0.456	0.495	0.457	1.000		
LS5	0.469	0.465	0.355	0.354	1.000	
LS6	0.503	0.501	0.417	0.377	0.570	1.000

In the CE indicator group, CE 2 had the highest mean (3.110), which indicates that, on average, participants neither agree nor disagree with the statement "People like me don't have any say about what the government does." CE 1, which was a measure of frequency of

volunteerism, had the lowest mean value (2.106), indicating that, on average, participants report volunteering less than once a month. The means for the two social trust variables CE 3 – "If you are not careful other people will take advantage of you" (2.139) and CE 4 – "There are only a few people you can trust completely" (2.398) show that, on average, participants agree with both of these statements. The variance was similar across variables with most having a variance between 1.326 and 1.499; however, CE 3 had a lower variance (1.006). The CE variances are similar in value to those of the ILA indicators, while the LS indicators remain the variable set with the lowest variances. As expected, CE 3 and CE 4 have the highest correlation (0.505) as they are both measures of social trust. There is also a weak to moderate correlation between CE 2 and CE 4 (0.254). In general, the correlations between the CE indicators are low. The lowest correlation occurs between CE 1 and CE 3 (0.100). In fact, volunteerism (CE 1) seems to be the least correlated variable in the group. Although weak, all correlations are positive.

Table 4.6

Means, Variances, and Correlations of CE Indicators

Variable	CE1	CE2	CE3	CE4
Mean	2.106	3.110	2.139	2.398
Variance	1.326	1.499	1.006	1.445
CE1	1.000			
CE2	0.156	1.000		
CE3	0.100	0.189	1.000	
CE4	0.131	0.254	0.506	1.000

When comparing the correlations between the ILA indicators and the LS indicators, the weakest correlation is found between ILA 5 and LS 1 (0.027). This implies that there is almost no correlation between the frequency of reading directions and agreement/disagreement with the statement "I like to learn new things." In fact, the weakest correlations, yet still all positive, occur between ILA 5 and all of the LS indicators, with none having a correlation above 0.087. The largest correlation (a moderate one) is found between ILA 9 and LS 5 (0.273). This could imply that there a positive relationship between the frequency of using the Internet to better understand issues and agreement with the statement "When I hear or read about new ideas, I try to relate them to real life situations to which they might apply." In fact, most of the correlations between ILA 9 and the LS indicators are moderate and positive. In general, the remaining ILA indicators have weak positive correlations with the LS indicators with values of at least 0.1 but less than 0.2. The exceptions are ILA 2 and LS 5 (0.247) and ILA 8 and LS 5 (0.210). This may imply at least a moderate positive relationship between the frequency of reading letters/using email and the tendency to relate new ideas to real life situations.

When comparing the correlations between the ILA indicators and the CE indicators, the smallest positive correlation is seen between ILA 9 and CE 3 (0.008). This implies there is almost no correlation between the frequency of using the Internet to better understand issues and agreement/disagreement with the likelihood of other people taking advantage of you. The smallest negative correlation is seen between ILA 6 and CE 2 (-0.005). This implies that there is almost no correlation between the frequency of calculating prices and feelings about political efficacy, and any relationship that does exist is inverse. ILA 5 and ILA 6 have weak negative correlations with three of the four CE indicators. This could indicate a negative correlation (albeit weak) between frequency of using numeracy skills and political efficacy/social trust.

There is also a weak negative correlation between ILA 1 and CE 3 (-0.039). In fact, CE 3 has weak negative correlations with three of the ILA indicators and only weak positive correlations with the others with no value above 0.1. CE 4 only has one correlation above 0.1 with an ILA indicator. The correlation between ILA 3 and CE 4 is 0.134. The highest correlation between any CE indicator and an ILA variable is 0.196 (ILA 4 and CE 1). This indicates the greatest correlation between informal learning and civic engagement may be related to the frequency of writing letters/email and the frequency of volunteering.

Table 4.7

Correlations of ILA Indicators with LS and CE Indicators

Variable	ILA1	ILA2	ILA3	ILA4	ILA5	ILA6	ILA8	ILA9
LS1	0.136	0.116	0.130	0.191	0.027	0.159	0.184	0.245
LS2	0.123	0.094	0.128	0.163	0.041	0.139	0.172	0.243
LS3	0.108	0.087	0.086	0.139	0.087	0.131	0.134	0.187
LS4	0.132	0.138	0.106	0.177	0.068	0.143	0.196	0.244
LS5	0.158	0.172	0.170	0.247	0.062	0.141	0.210	0.273
LS6	0.132	0.119	0.106	0.174	0.063	0.130	0.170	0.203
CE1	0.079	0.125	0.104	0.196	0.016	0.044	0.135	0.106
CE2	0.046	0.095	0.129	0.111	-0.025	-0.005	0.109	0.052
CE3	-0.039	0.047	0.078	0.079	-0.031	-0.084	0.072	0.008
CE4	0.029	0.082	0.134	0.092	-0.037	-0.053	0.081	0.027

When comparing the correlations between LS indicators and CE indicators, it is apparent that these two variable groups have very weak correlations. The largest correlation is between LS

5 and CE 1 (0.178). This implies there may be a positive association between relating new ideas to real life and the frequency of volunteering. The smallest correlation is between LS 4 and CE 4 (0.002). Given this value is extremely close to zero, this implies that there is virtually no relationship between looking for more information when something is unclear and feeling that one can only trust a few people completely. CE 3, the other social trust variable, has weak negative correlations with three of the LS indicators (LS 2, LS 3, and LS4). None of the social trust variables (CE 3 and CE 4) had correlations above 0.091 with the LS indicators. The frequency of volunteering (CE 1) had a slightly stronger correlation with the LS indicators than CE 2 (political efficacy), yet no relationship between LS and CE variables could be categorized as moderate with the possible exception of LS 5 and CE 1. The remaining correlations between these groups fell between low to (almost) no correlation. This indicates relatively little correlation between lifelong learning mindset indicators and civic engagement indicators in this sample.

Table 4.8

Correlations of LS Indicators with CE Indicators

Variable	LS1	LS2	LS3	LS4	LS5	LS6
CE1	0.122	0.122	0.078	0.068	0.178	0.125
CE2	0.112	0.083	0.054	0.082	0.156	0.067
CE3	0.047	-0.021	-0.034	-0.014	0.060	0.018
CE4	0.056	0.011	-0.020	0.002	0.091	0.047

Skewness statistics and graphing in SPSS confirmed that the data were not normally distributed. Two exceptions were LS5 (relate to real life) and CE2 (political self-efficacy) which

both had moderately normal distributions (-0.240 and -0.259). In general, variables related to informal learning activities and learning strategies were negatively skewed, while variables related to civic engagement were positively skewed. This non-normality indicates that participants engaged in informal learning activities with greater frequency and had greater tendencies towards lifelong learning mindset than would be expected if the data were distributed normally. Conversely, the positive skew of civic engagement indicators indicates that participants engaged less frequently in volunteerism and held more negative views towards social trust than would be expected if the data were normally distributed. Again, CE2 was an exception as it was slightly negatively skewed, which indicates that participants displayed attitudes towards political efficacy that were similar to what would be expected to slightly more favorable. Table 4.9 shows the skewness for each observed variable. Figures 4.1, 4.2, and 4.3 graph the normality of a representative variable from each of the ILA, LS, and CE groups respectively.

Table 4.9

Skewness of Observed Variables

Variable	Skewness
ILA1	-0.601
ILA2	-2.590
ILA3	-1.294
ILA4	-0.886
ILA5	-0.798
ILA6	-0.572
ILA8	-2.221

ILA9	-1.390
LS1	-0.988
LS2	-0.463
LS3	-0.627
LS4	-1.013
LS5	-0.240
LS6	-0.578
CE1	0.697
CE2	-0.259
CE3	0.875
CE4	0.589

Figure 4.1
Distribution of Values for ILA1 (Read Directions)

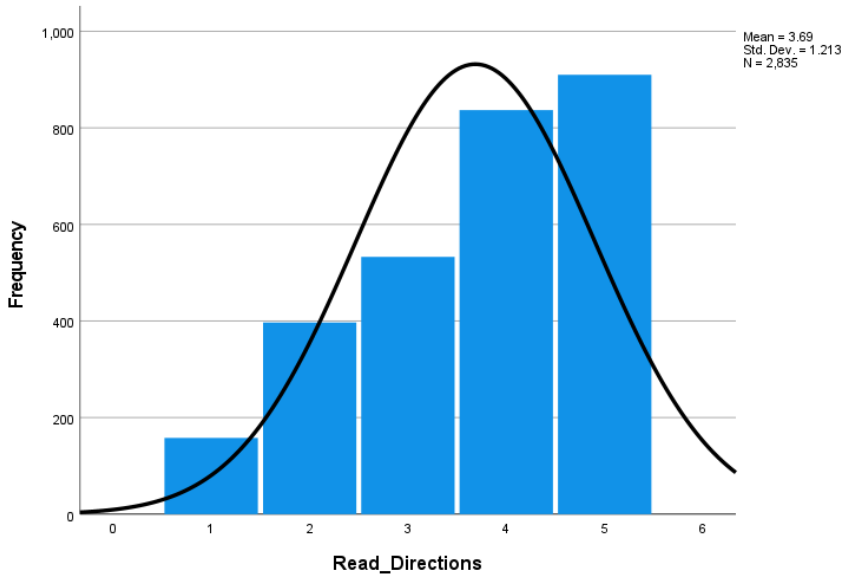


Figure 4.2

Distribution of Values for LS1 (Learn New Things)

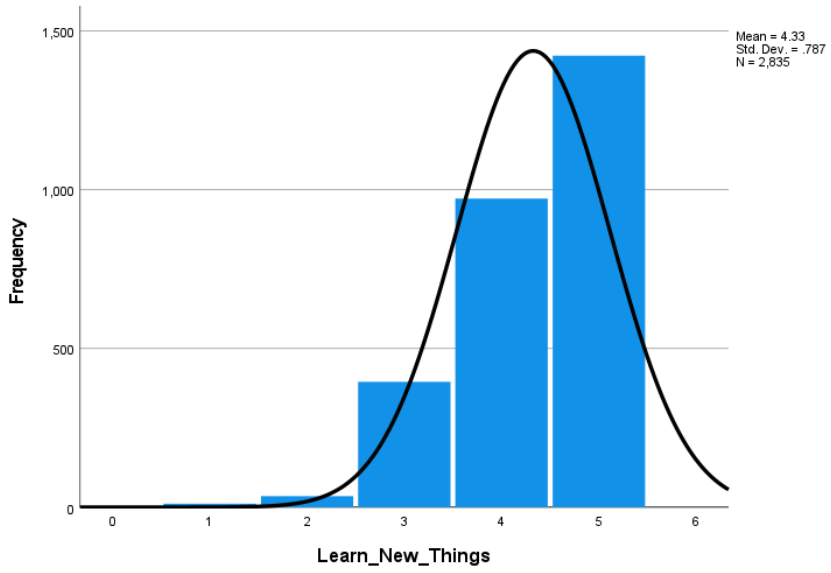
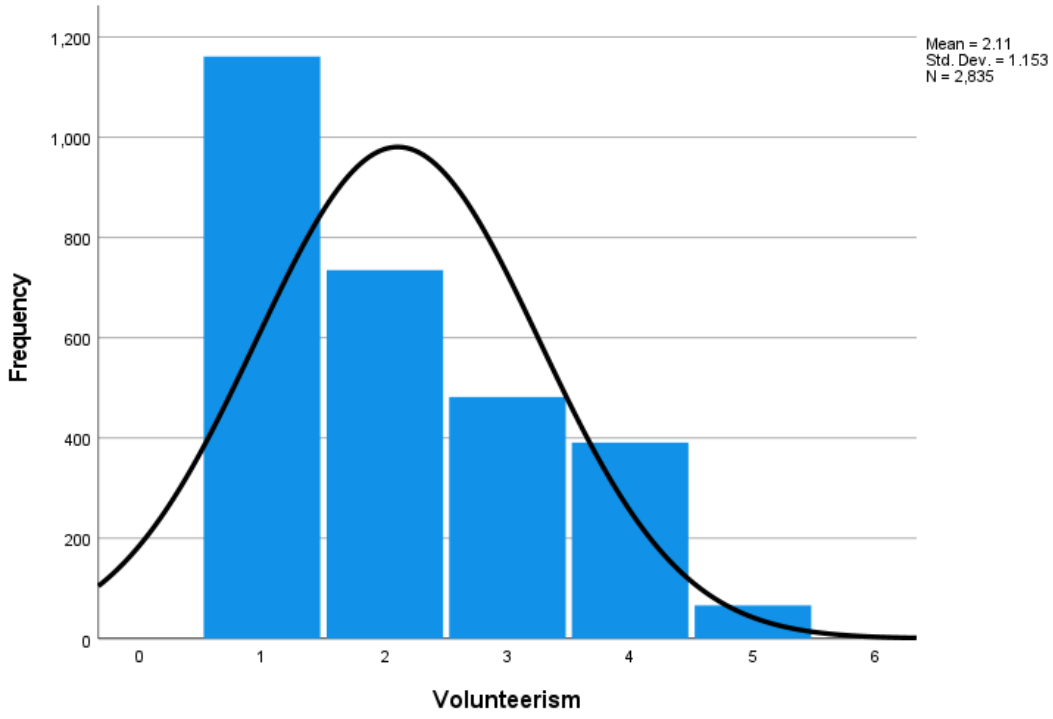


Figure 4.3

Distribution of Values for CE1 (Volunteerism)



Research Question 1 Model Results

The first research question asked what latent structure best explains the variability in response patterns related to frequency of everyday informal learning activities. Initially, two confirmatory factor analysis (CFA) models were proposed to answer this question. Hypothesis one (H1) analyzed a one factor model and hypothesis two (H2) analyzed a three-factor model. After testing H1 and H2, there was sufficient empirical evidence to also test a two-factor model (H2-1). A summary of global fit statistics for models H1, H2, and H2-1 is shown in table 4.10.

Table 4.10

Summary of Global Fit Statistics for H1, H2, and H2-1 Models

Statistic	H1	H2	H2-1
$\chi 2$	301.770	164.770	188.756
df	20	17	19
p	0.0000	0.0000	0.0000
RMSEA [90% CI]	.071 [.064, .078]	.055 [.048, .063]	.056 [.049, .064]
$p < .05$	0.000	.116	0.076
CFI	.597	.789	.757
TLI	.436	.652	.642
SRMR	.214	.104	.130

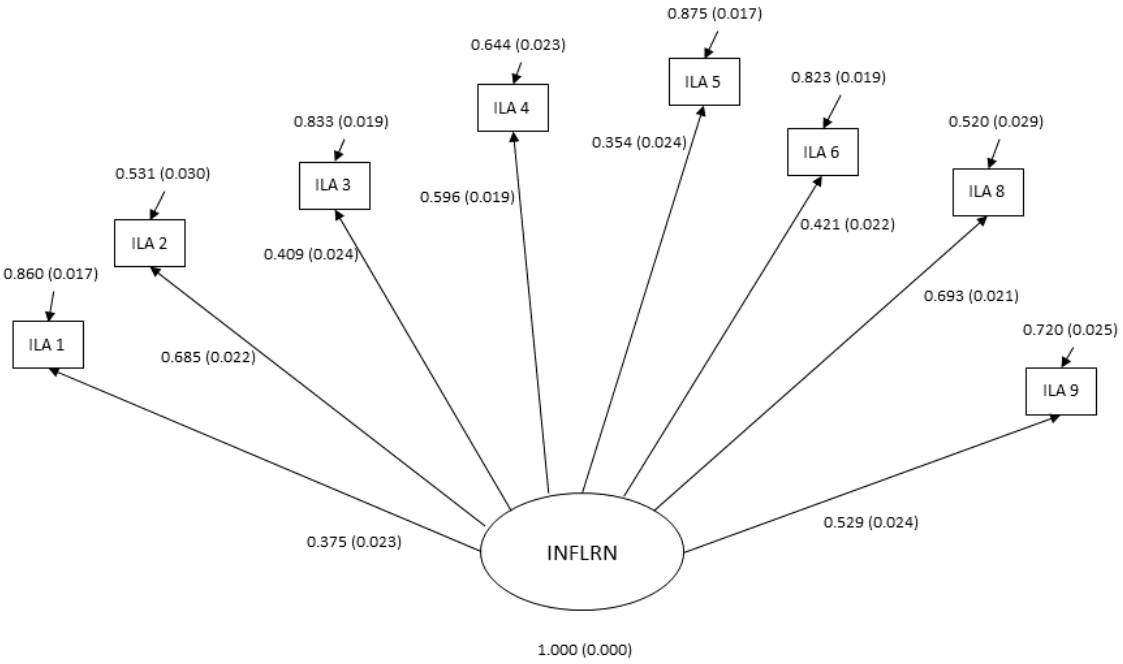
H1: The eight most common everyday learning activities (ILA) of respondents to the PIAAC are reliable indicators of one latent factor called informal learning.

This model was proposed based on the PIAAC's conceptual framework (OECD, 2009) for the background survey. This document states that the purpose of including items I_Q05a-h (ILA 1-9 in this study) is to include "activities in which respondents may be involved in everyday life from which they can learn" (OECD, 2009, p. 25). The reason for selecting only the activities that at least half of survey respondents said they engaged in on at least a weekly basis is to capture the organic effects of informal learning as opposed to attempting to measure the effects of a prescribed, formal intervention. This model seeks to represent the "actually existing learning city" proposed by Buchczyk and Facer (2018).

Model H1 failed the exact fit test (χ^2 [20] = 301.770, p = 0.000) and other global fit statistics were not in an acceptable range (RMSEA = 0.071; CFI = 0.597; SRMR = 0.214). Local fit statistics for H1 indicated poor explanatory value for most model variables. The H1 model diagram with standardized pattern coefficients is shown in figure 4.4. Only two variables approached a standardized pattern coefficient value of 0.7: ILA 2 (0.685) and ILA 8 (0.693). The lowest performing variable was ILA 5 (0.354), with most values in the 0.4 to 0.5 range. These values correspond with the R^2 results that showed that ILA 2 explained 46.9% of the variance and ILA 8 explained 48%. The lowest R^2 value, as expected, was related to ILA 5 (0.125). The remaining R^2 values ranged from 0.14 to 0.356. However, no model residuals exceeded 2.000. Given its poor global and local fit, the H1 models was rejected, which validated the need to test the H2 model.

Figure 4.4

Model H1: Path Diagram with Standardized Coefficients



H2: Informal learning can be reliably measured by dividing the eight most common ILAs in the PIAAC into unique indicators assigned to three latent factors (Literacy, Numeracy, and Applied Technology).

The PIAAC further categorizes the background survey questions under "skill use in everyday life" (which are the indicators used in this study for ILA) into the following groups: literacy, numeracy, and information and communication technology (ICT). Therefore, an alternate model that reflected this subcategorization seemed plausible. PIAAC variables categorized under literacy were used as indicators for the Literacy factor, those categorized under Numeracy were used as indicators for the Numeracy factor, and those categorized under ICT were used as indicators for the Applied Technology factor.

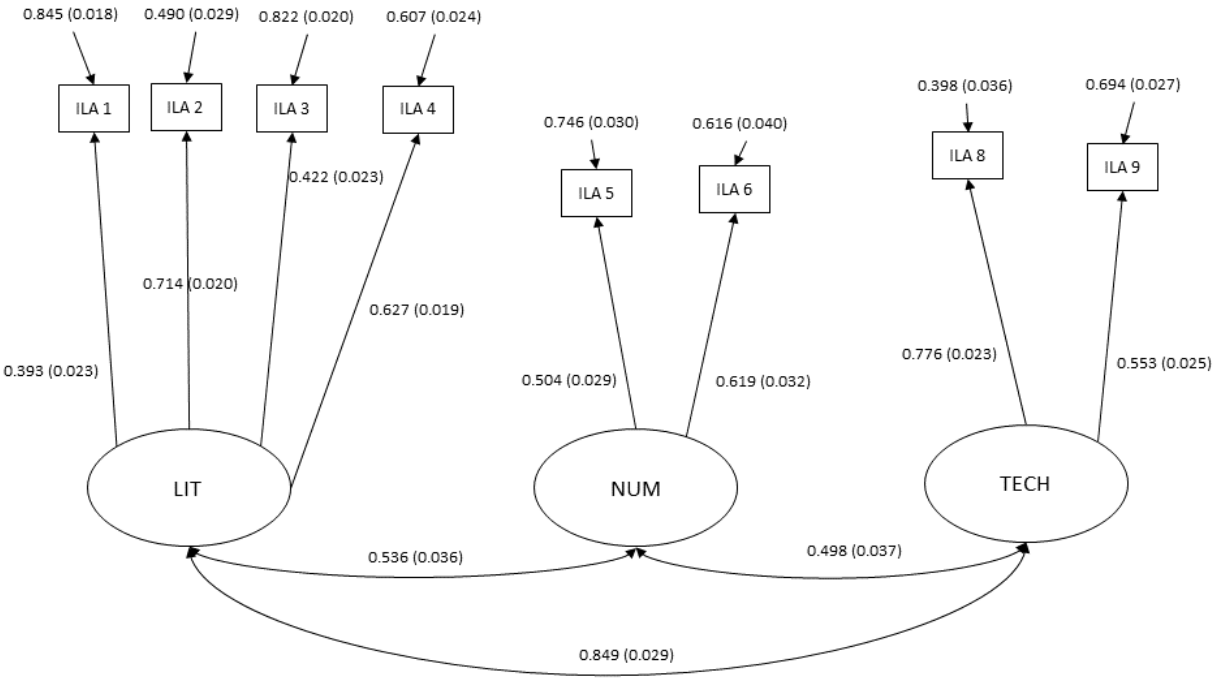
Model H2 failed the exact fit test (χ^2 [17] = 164.770, p = 0.000) and other global fit statistics did not produce acceptable values (RMSEA = 0.055; CFI = 0.789; SRMR = 0.104). However, the global fit of H2 was better than H1. Regarding local fit statistics for the H2 model, most of the specifications resulted in variables showing more explanatory value than the H1 specifications. The H2 model diagram with standardized pattern coefficients is shown in figure 4.5. The H2 model produced two standardized pattern coefficients with values higher than 0.7: ILA 2 (0.714) and ILA 8 (0.776). The lowest value was for ILA 1 (0.393) and most values ranged between 0.5 and 0.6. The R^2 values for H2 also explained more of the variance than the H1 model. For example, ILA 8 explained 60.2% and ILA 2 explained 51%. The lowest R^2 value for H2 was 0.155 (ILA 1), with most values in the 0.30 range. No residuals exceeded 2.000.

The H2 model was tentatively rejected based on failing the exact fit test. However, Kline (2016) cautioned that this should not be the sole criterion for rejecting a model, especially in

cases that include large datasets, such as the PIAAC. Other global fit tests, such as RMSEA, CFI, and SRMR should be considered. This tentative rejection validated the need to test model H2-1.

Figure 4.5

Model H2: Path Diagram with Standardized Coefficients



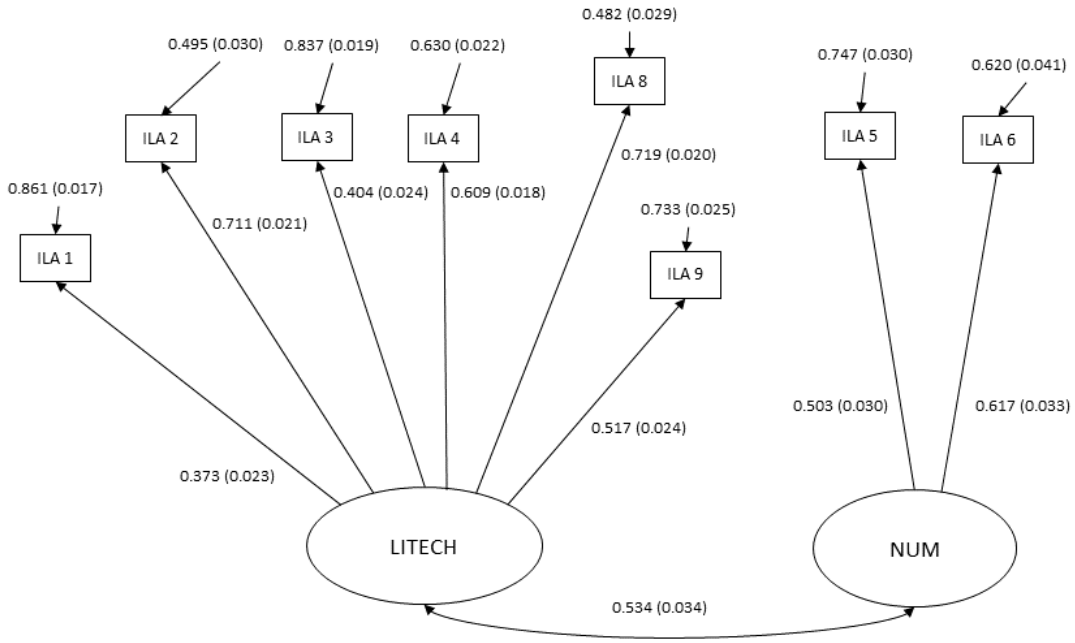
H2-1: Informal learning can be reliably measured by dividing the eight most common ILAs in the PIAAC into unique indicators assigned to two latent factors (LITECH and NUM).

This model was not originally proposed as it does not reflect the PIAAC's conceptual framework. However, after running the H1 and H2 models, empirical evidence existed to support combining the Literacy and Applied Technology factors to create an alternate CFA specification using two factors (LITECH and NUM). This decision was based on the strong to moderate correlation between ILA 8 and ILA 9 (TECH indicators) with the LIT indicators, ILA 2 (0.522 and 0.237) and ILA 4 (0.474 and 0.295). Conceptually, this respecification was reasonable given that ILA 8 (using email) and ILA 9 (using the Internet to find more information) both require literacy skills, and aspects of ILA 2 and ILA 4 could involve technology (reading/writing email).

Model H2-1 failed the exact fit test (χ^2 [19] = 188.756, p = 0.000) and other global fit statistics were in a moderate to not acceptable range (RMSEA = 0.056; CFI = 0.757; SRMR = 0.130). Local fit statistics for H2-1 were comparable to those of model H2. Two variables had standardized pattern coefficients higher than 0.7: ILA 2 (0.711) and (0.719). ILA 1 had the lowest pattern coefficient (0.373), while the remaining indicators ranged from 0.404 to 0.617. ILA 8 (R^2 = 0.518) and ILA 2 (R^2 = 0.505) had the highest explanatory value. ILA 1 (R^2 = 0.139) and ILA 3 (R^2 = 0.163) had the lowest. The remaining indicators explained between 25% and 38% of the variance. No residuals were above 2.000. The model diagram for H2-1 with standardized coefficients is shown in figure 4.6. Given that the global fit of H2 (χ^2 [17] = 164.770, p = 0.000, RMSEA = 0.055; CFI = 0.789; SRMR = 0.104) was better than H2-1 and their respective local fit statistics were comparable, model H2-1 was rejected. Model H2 was selected for further analysis and modifications were made to improve model fit.

Figure 4.6

Model H2-1 Path Diagram with Standardized Coefficients



Because H2 was the better fitting CFA model for informal learning, yet still did not produce decisively acceptable results, this model was respecified to improve global fit. Modification indices suggested that improvement to fit could be made by correlating the error terms of ILA 8 with ILA 2 and ILA 8 with ILA 4 (31.737 and 11.885). Additionally, suggestions were made to add ILA 9 to the "by" statements for both the latent variables LIT (19.469) and NUM (19.574), as well as adding ILA 8 to the "by" statement for LIT (19.762). It did make sense that using the Internet to find more information (ILA 9) could be an indicator of using literacy- and numeracy-related informal learning, and that using email (ILA 8) could be an indicator of literacy-related informal learning. Therefore, this respecification was tested as model H2a. However, this model did not produce admissible results. A possible reason was the model was not identified. To address this issue, the model was respecified as H2b which removed the ILA 9 variable as an indicator of NUM. Model H2b also did not produce admissible results. It was likely that sharing indicators among the latent variables was causing model identification issues. To remedy this error, model H2c removed the additional "by" statements so that each latent variable had unique indicators, yet it kept the correlated error terms with ILA 8 and ILA 2, and ILA 8 and ILA 4. Model H2c did not pass the exact fit test (χ^2 [15] = 83.271, p = 0.000), yet it did produce more favorable results for the other global fit statistics (RMSEA = 0.040; CFI = 0.902; SRMR = 0.052). While sharing indicators had caused issues, one more attempt was made given modification indices that suggested improvement to the model by adding ILA 2 and ILA 4 as indicators of TECH (31.203 and 7.721), which made sense due to the strong association between reading and writing email and using email. An additional change was made to correlate the error terms of ILA 2 with ILA 4 (23.374) because reading and writing letters (including email) seem to be logically related activities. This respecification was tested as model H2d and

did not pass the exact fit test (χ^2 [12] = 39.075, p = 0.001), but had much better results with the other global fit tests (RMSEA = 0.028; CFI = 0.961; SRMR = 0.023). Because of the earlier issues with sharing indicators among latent variables, a decision was made to test one more model which removed the additional "by" statements from H2d so that no indicators would be shared yet kept all of the "with" statements. This model was specified as H2e. It still did not pass the exact fit test (χ^2 [14] = 59.807, p = 0.000). While it also produced other favorable global fit statistics (RMSEA = 0.034; CFI =0.934; SRMR = 0.038), the overall fit was not as good as that produced by H2d. A summary of the global fit statistics for each respecified H2 model is shown in table 4.11.

Table 4.11

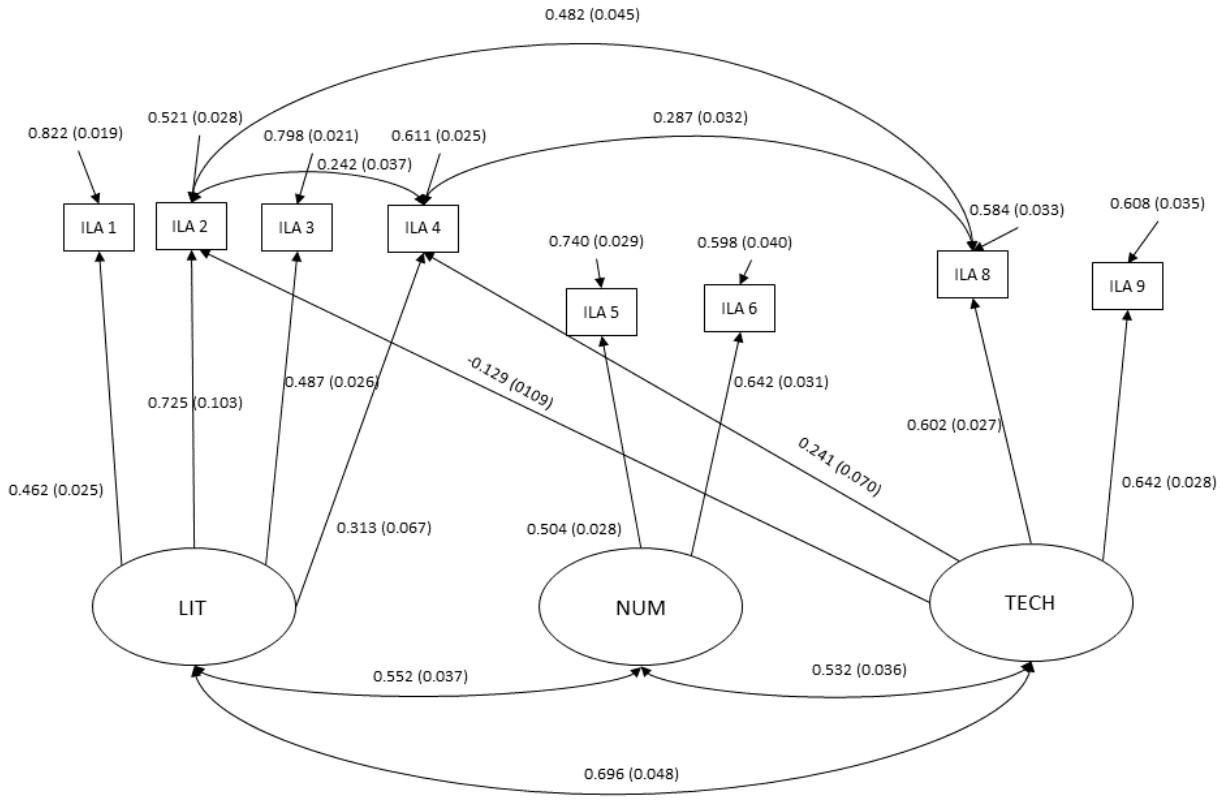
Summary of Global Fit Statistics for H2 and Respecified Three-Factor Models

Statistic	H2	H2c	H2d	H2e
χ2	164.770	83.271	39.075	59.807
df	17	15	12	14
p	0.0000	0.0000	.0001	0.0000
RMSEA [90% CI]	.055 [.048, .063]	.040 [.032, .049]	.028 [.019, .038]	.034 [0.26, .043]
p < .05	.116	.971	1.000	.998
CFI	.789	.902	.961	.934
TLI	.652	.818	.910	.869
SRMR	.104	.052	.023	.038

Model H2d was the best fitting respecified model and produced results that met the suggested acceptable values for RMSEA, CFI, and SRMR. However, Kline (2016) cautions that a model that fails the Chi-square (exact fit) test yet performs well on the other global fit tests should not just be accepted based on that fact alone. He suggests taking the local fit into consideration as the goal is to find the source(s) of specification error. Similar to Model H2, model H2d had acceptable local fit and the indicators had reasonable explanatory value (as shown in the H2d model diagram in figure 4.7) with no residuals above 2.000. Consequently, H2d was accepted for use in the final structural regression model used in this study.

Figure 4.7

Model H2d: Path Diagram with Standardized Coefficients



Research Question 2 Model Results

The second research question asked what latent structure best explains the variability in response patterns related to level of agreement with statements related to learning strategy. Three confirmatory factor analysis (CFA) models were tested to answer this question. Hypothesis three (H3) analyzed a one-factor model, hypothesis four (H4) analyzed a three-factor model, and hypothesis five (H5) analyzed a two-factor model. A summary of global fit statistics for models H3 and H5 (H4 did not produce an admissible solution) is shown in table 4.12.

Table 4.12

Summary of Global Fit Statistics for H3 and H5 Models

Statistic	H3	H5
$\chi 2$	217.575	94.353
df	9	8
p	0.0000	0.0000
RMSEA [90% CI]	.090 [.080, .101]	.062 [.051, .073]
$p < .05$	0.000	.037
CFI	.844	.936
TLI	.740	.879
SRMR	.071	.045

H3: The six learning strategies (LS) questions in the PIAAC are reliable indicators of one latent factor called lifelong learning mindset.

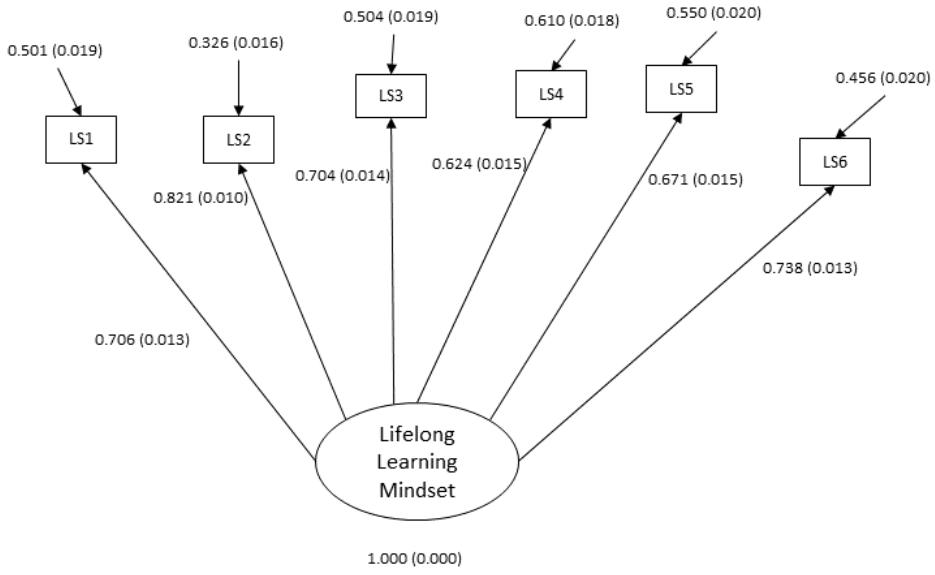
The PIAAC Conceptual Framework (OECD, 2009) provides a rationale for including items on the background survey that assess personal traits: these qualities "have been found to be especially important in determining performance in education and work and on how people shape their lives and direct their own development" (p. 18). The six learning strategies questions/variables are part of the "personal traits" that the PIAAC measures and are specifically intended to evaluate meta-cognition. These variables were selected as the indicators of lifelong learning mindset because possessing the qualities of this factor reflects one's metacognitive ability. Wielkiewicz and Meuwissen (2014) used a 16-item, one-factor scale to measure lifelong learning tendency that included several items similar to the learning strategies questions, such as "I like to learn new things." Kirby et al. (2010) designed a 14-item, one-factor instrument which also included similar items, such as "When I approach new material, I try to relate it to what I already know."

Model H3 did not pass the exact fit test (χ^2 [9] = 217.575, p = 0.000). Other global fit statistics were also not favorable (RMSEA = 0.090; CFI = 0.844; SRMR = 0.071). However, tests of local fit demonstrated strong explanatory value. Most indicators in model H3 produced standardized pattern coefficients greater than 0.7 with the exception of LS 4 (0.624) and LS 5 (0.671). H3 had high R^2 values with half of the variables at or over 50%. LS 2 had the most explanatory value (R^2 = 0.674), while LS 4 provided the least explanation (R^2 = 0.390). No residuals exceeded 2.000. Although the indicators demonstrated good explanatory value, model H3 was tentatively rejected because it failed the exact fit test and showed poor global fit overall.

This performance validated the need to test additional models. The model diagram for H3 with standardized coefficients is shown in figure 4.8.

Figure 4.8

Model H3: Path Diagram with Standardized Coefficients



H4: Lifelong Learning Mindset can be reliably measured by dividing the six Learning Strategies questions in the PIAAC into unique indicators assigned to three latent factors (Motivation, Persistence, and Self-Directedness).

Unlike the case of the "everyday skills" (ILA) questions, PIAAC documentation does not state that the six learning strategies questions are subdivided into distinct factors. However, several validated instruments designed to measure lifelong learning mindset/tendency have assessed at least two or more distinct factors. The most common of these factors are motivation, persistence, and self-directedness/self-efficacy (Gür Erdogan & Arsal 2015; Coşkun & Demirel, 2010; Drewery et al., 2020). This model was proposed because the six learning strategies questions from the PIAAC could be divided into indicators for each these factors.

Model H4 produced a latent variable covariance matrix that was not positive definite and did not produce an admissible solution. It was therefore rejected. This rejection validated the need to test the last model, H5.

H5: Lifelong Learning Mindset can be reliably measured by dividing the six Learning Strategies questions in the PIAAC into unique indicators assigned to two latent factors (Motivation-Persistence and Self-Directedness).

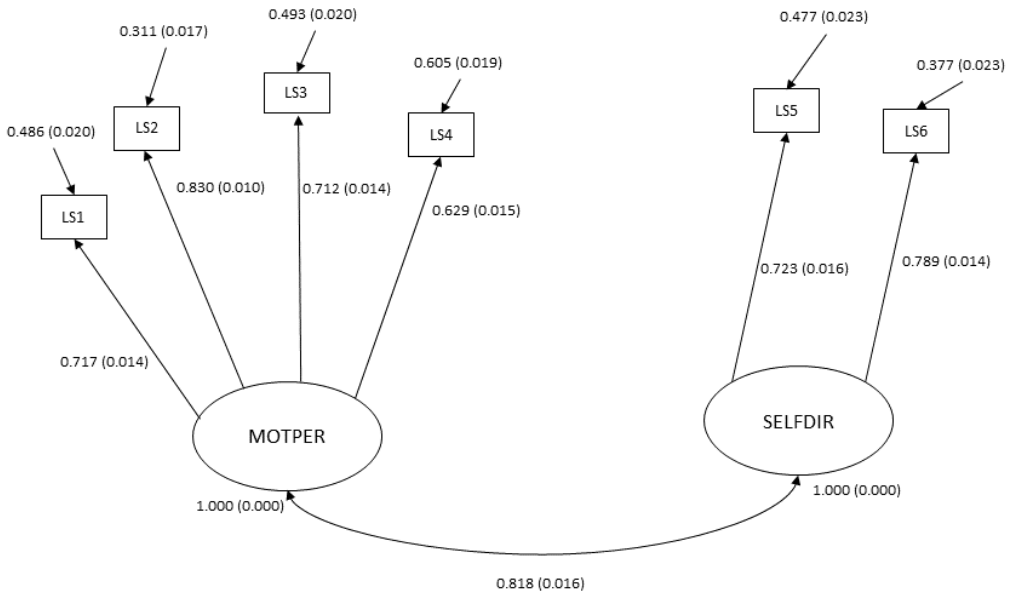
The validated instruments that supported the three-factor model also provided evidence for specifying a two-factor model. The Coşkun & Demirel (2010) lifelong learning tendency scale is a four-factor model divided into two dimensions: a positive aspect (motivation and perseverance) and a negative aspect (lack of regulating learning and lack of curiosity).

Model H5 failed the exact fit test (χ^2 [8] = 94.353, p = 0.000), yet produced reasonable results on the other global fit tests (RMSEA = 0.062; CFI = 0.936; SRMR = 0.045), all of which were much better than H3. Model H5 also performed better than H3 on local fit tests. The model

diagram for H5 with standardized coefficients is shown in figure 4.9. All but one variable, LS 4 (0.629), resulted in standardized pattern coefficients of at least 0.700 or greater. Additionally, all but one variable, LS 4 (0.395) had R^2 values above 0.500. No residuals exceeded 2.000. Given H5 had adequate global fit and stronger explanatory value than H3, this model was retained for further analysis and modification for potential use in the final structural regression model.

Figure 4.9

Model H5: Path Diagram with Standardized Coefficients



Because H5 was the better fitting CFA model for lifelong learning mindset, yet still had not passed the exact fit test, this model was respecified to improve global fit. Modification indices suggested that adding LS 1 as an indicator of the latent variable SELFDIR would improve model fit (59.254). This modification was made, and the model was respecified as H5a. This model had better global fit, yet also failed the exact fit test (χ^2 [7] = 34.962, p = 0.000). Other tests of global fit produced acceptable results (RMSEA = 0.038; CFI = 0.979; SRMR = 0.021). Although modification indices did not indicate correlating the error term of LS 6 with LS 5 would improve model fit, this respecification was made to the original H5 model and tested as H5b. This specification was based on the similarity of LS 6 and LS 5 as both involved receiving new information and relating it to something else. However, model H5b produced a latent variable covariance matrix that was not positive definite and did not produce an admissible solution. It was therefore rejected. One more attempt was made to improve the global fit of the two-factor model. Modification indices suggested that a modest improvement could be made by correlating the error term for LS 4 with LS 3 (3.872). Because there is a logical connection between looking for more information when something is unclear (LS 4) and getting to the bottom of difficult things (LS 3), this respecification was made as model H5c. This model failed the exact fit test (χ^2 [7] = 88.220, p = 0.000). It produced acceptable values for the other global fit tests, yet not as good as H5a (RMSEA = 0.064; CFI = 0.939; SRMR = 0.047). Consequently, H5a was accepted for use in the final structural regression model used in this study. A summary of the global fit statistics for the respecified H5 models is shown in table 4.13 and the model diagram for H5a with standardized coefficients is shown in figure 4.10.

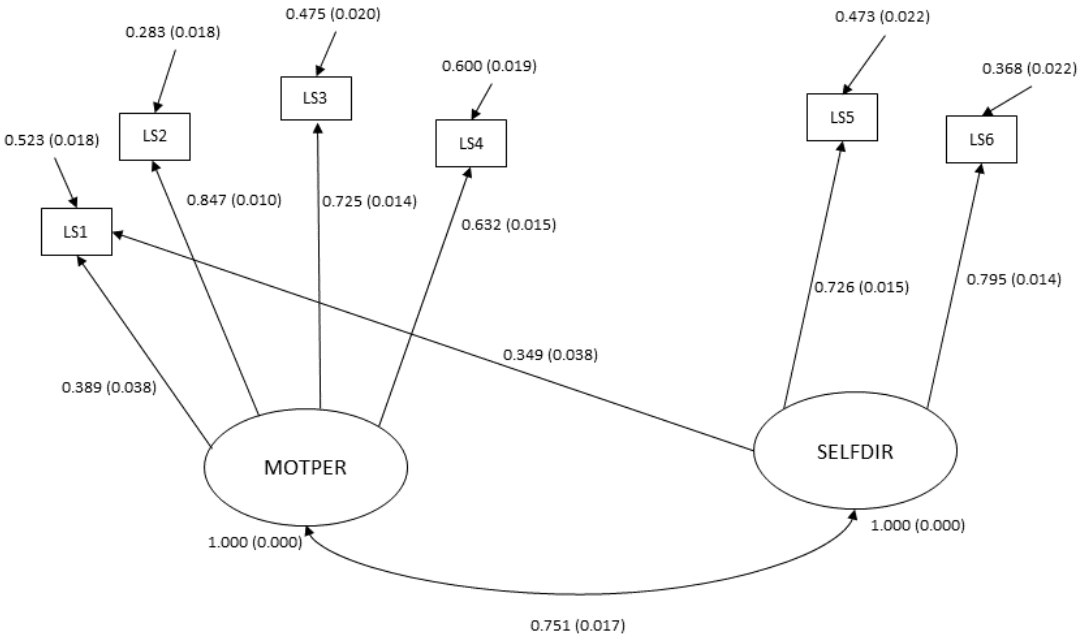
Table 4.13

Summary of Global Fit Statistics for H5 and Respecified Two-Factor Models

Statistic	H5	H5a	H5c
$\chi 2$	94.353	34.962	88.220
df	8	7	7
p	0.0000	0.0000	0.0000
RMSEA [90% CI]	.062 [.051, .073]	.038 [.026, .050]	.064 [.052, .076]
$p < .05$	.037	.944	.023
CFI	.936	.979	.939
TLI	.879	.955	.870
SRMR	.045	.021	.047

Figure 4.10

Model H5a: Path Diagram with Standardized Coefficients



Research Question 3 Model Results

The third research question asked to what extent civic engagement (CIVENG) can be measured through factors related to volunteerism, political self-efficacy, and social trust. One confirmatory factor analysis (CFA) model was tested to answer this question. Hypothesis six (H6) analyzed this one-factor model.

H6: The four civic engagement (CE) questions in the PIAAC are reliable indicators of one latent factor called civic engagement.

According to the PIAAC conceptual framework, the background survey includes questions related to civic engagement, political self-efficacy, and social trust because these are important social outcomes that are believed to have a relationship with education (OECD, 2009). The case for including these questions on the PIAAC is based on the assumption that "education directly affects knowledge and skills that are relevant for . . . civic engagement" and indirectly affects civic participation through "social networks in which civic engagement is higher" (OECD, 2009, p. 31). While the civic engagement CFA model could be broken into more than one factor from a theoretical perspective, such as a three-factor model (volunteerism, political self-efficacy, social trust), the PIAAC does not ask a sufficient number of questions to produce enough indicators for a multi-factor model that would be identified.

Model H6 did not pass the exact fit test (χ^2 [2] = 33.408, p = 0.000). However, other global fit tests produced acceptable results (RMSEA = 0.074; CFI = 0.954; SRMR = 0.028). Modification indices suggested that correlating the error term for CE 4 with CE 3 would improve model fit (33.433). This modification made sense as those variables both related to social trust. This model was respecified as H6a, which passed the exact fit test (χ^2 [1] = 0.009, p = 0.9236).

Other global fit statistics were also acceptable (RMSEA = 0.000; CFI = 1.00; SRMR = 0.000). A summary of the global fit statistics for the H6 and the respecified model is shown in table 4.14.

Table 4.14

Summary of Global Fit Statistics for H6 and Respecified One-Factor Model

Statistic	H6	H6a
$\chi 2$	33.408	.009
df	2	1
p	0.0000	.9236
RMSEA [90% CI]	.074 [.054, .098]	0.000 [0.000, .017]
p < .05	.028	.998
CFI	.954	1.00
TLI	.861	1.00
SRMR	.028	0.000

While H6a could be retained based on global fit, local fit statistics for neither H6 nor H6a demonstrated great explanatory value. Model H6 resulted in one standardized pattern coefficient above 0.700 (CE 4 was 0.798). No pattern coefficients were above that threshold in model H6a, possibly because CE 4 and CE 3 were correlated. The R^2 of CE 4 in H6 was 0.636, but it decreased to 0.214 in H6a (again likely due to correlation with CE 3). CE 1 (volunteerism) explained less than 10% of the variance in H6a (0.081), which was slightly better than its value in model H6 (0.035). However, the R^2 of CE 2 (political self- efficacy) increased from H6 to H6a (0.110 to 0.301), making CE 2 the indicator with the most explanatory value in H6a. No

residuals exceeded 2.000. Model H6a was selected for use in the final structural regression model due to its better global fit and comparable local fit when compared with H6. The model diagrams for H6 and H6a are shown in figures 4.11 and 4.12.

Figure 4.11

Model H6: Path Diagram with Standardized Coefficients

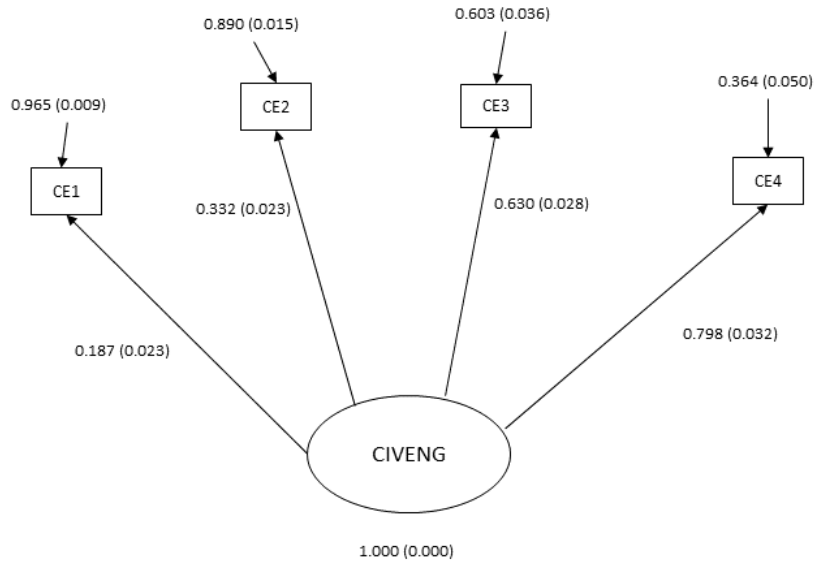
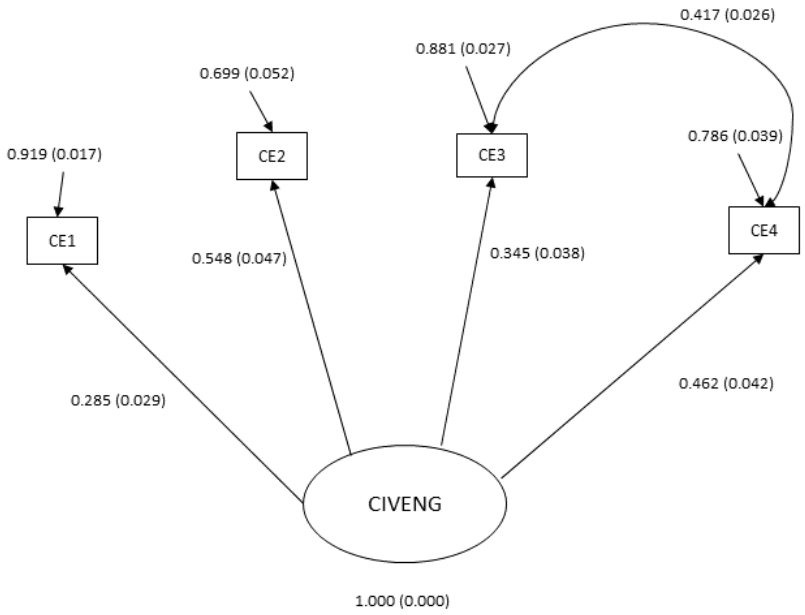


Figure 4.12

Model H6a: Path Diagram with Standardized Coefficients



Research Questions 4, 5, 6 Model Results

Research question four asked what the relationship was between informal learning and lifelong learning mindset; research question five asked what the relationship was between lifelong learning mindset and civic engagement; and research question six asked what the effect of informal learning was on civic engagement mediated by lifelong learning mindset. One fully latent structural regression model (finalSR) was constructed to answer these questions. This model was based on the Rüber et al. (2018) conceptual framework for how adult education affects civic participation. A detailed explanation of how this conceptual model was specified as a structural regression model is provided in chapter three.

The structural regression model finalSR used the CFA models with the best global and local fit statistics: H2d, H5a, and H6a. Model H2d was specified for the latent variables LIT, NUM, and TECH; model H5a for MOTPER and SELFDIR; and model H6a for CIVENG. This model did not produce an admissible result because convergence was not reached and the number of iterations was exceeded.

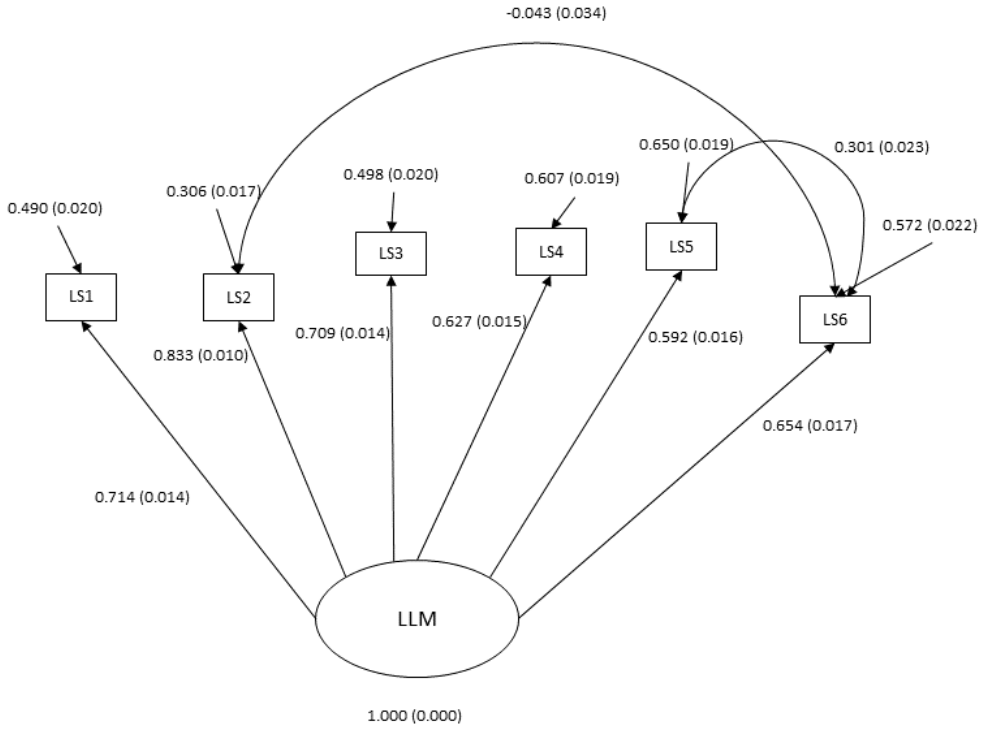
Because shared indicators could have been part of the problem, model H2d (which uses shared indicators) was abandoned. The next best fitting three-factor model for informal learning was H2e; however, it was discarded in favor of H2c (the third best fitting three-factor model) because H2c was a simpler model and contained one less path than H2e. The goal of the respecification for finalSR2 was to decrease complexity to increase the likelihood of model convergence while still using models with a reasonable fit. For this reason, a similar change was made to the specification for lifelong learning mindset. Model H5a had been the best fitting, yet it included shared indicators. The next best fitting acceptable model was H5c, which did not use shared indicators. No changes were deemed necessary to the civic engagement specification as it

did not use any shared indicators. Model finalSR2 was tested using H2c, H5c, and H6a. This model was not able to reach convergence and the number of iterations was exceeded. Another attempt was made to simplify the model so that it could reach convergence while still using acceptably fitting models for the latent variables. Although the two-factor model seemed to indicate a better explanation of lifelong learning mindset than the one-factor model, it appeared that convergence might not be possible with anything but a one-factor model. Consequently, the modification indices that Mplus produced were used to respecify H3 to attain a better model fit.

Modification indices suggested that correlating the error terms of LS 6 with LS 5 (123.389) and LS 6 with LS 2 (17.346) would improve model fit. Since it followed logically that relating something new to things already known (LS 6) is associated with relating new ideas to real-life situations (LS 5) and figuring out how different ideas fit together (LS 2), these adjustments were made and respecified as model H3a. This model also failed the exact fit test (χ^2 [7] = 92.685, p = 0.000), yet performed moderately well on the other global fit tests (RMSEA = 0.066; CFI = 0.936; SRMR = 0.044) and produced a much better global fit than H3. The local fit of H3a was comparable to H3 as it had good explanatory value. The model diagram for H3a with standardized coefficients is shown in figure 4.13.

Figure 4.13

Model H3a: Path Diagram with Standardized Coefficients



Given that H3a (a one-factor model) had reasonable global fit and good local fit, the decision was made to abandon the two-factor model and respecify the structural regression model using this one-factor CFA model for the latent variable LLM. The informal learning and civic engagement models were left the same. This specification was tested as model finalSR3. This model produced admissible results but did not pass the exact fit test (χ^2 [124] = 659.570, p = 0.000). Other global fit statistics were mixed. The RMSEA was excellent (0.039), while the CFI (0.810) and SRMR (0.142) were mediocre to poor. Because these results were not favorable, and the initial hypothesis testing showed that a two-factor model for lifelong learning mindset

provided better fit than a one-factor model, one more attempt was made to use the simplest two-factor LLM CFA model in the final structural regression. Model finalSR5 was specified using H2c, H5, and H6a. However, this model did not reach convergence. It was determined that the only admissible structural regression model that had at least moderately acceptable global fit was finalSR3. A summary of the global fit statistics for finalSR3 is shown in table 4.15.

Table 4.15

Summary of Global Fit Statistics for Final Structural Regression Model

Statistic	finalSR3
$\chi 2$	660.016
df	124
p	0.0000
RMSEA [90% CI]	.039 [.036 - .042]
$p < .05$	1.000
CFI	.811
TLI	.766
SRMR	.140

An analysis of local fit of finalSR3 showed that most of the ILA variables had standardized pattern coefficients below 0.7, with the exception of ILA 6 (0.701). Several were close to 0.7: ILA 4 (0.605), ILA 8 (0.600) and ILA 9 (0.665). ILA 8 and ILA 9 were both indicators of the TECH variable. ILA 6 was an indicator of the NUM variable. The worst performing ILA indicator was ILA 1 (0.394) as most of the LIT indicators had lower pattern

coefficients. By contrast, the LLM indicators performed very well to moderately well. Four of the six were above 0.7 or could round to 0.7. The indicator with the highest value was LS 2 (0.826). The lowest value was for LS 5 (0.635). Again, in contrast, the CIVENG indicators were the worst performing in the model. No indicator had a standardized pattern coefficient above 0.7. The highest was CE 2 (0.531) and the lowest was CE 3 (0.238). Given this dataset, the ILA variables appear to be modest indicators of informal learning with the technology-related variables performing best and the literacy-related variables performing worst. The LLM variables seem to be strong indicators of lifelong learning mindset with the possible exception of the variables related to applying new ideas to real-life situations (LS 5) and to relating new information to what is already known (LS 6). However, these two variables' error terms were correlated which may have affected this statistic negatively. The CIVENG variables do not appear to very good indicators of civic engagement with CE 2 (political self- efficacy) being the only variable above 0.5. Some negative effects may be the result of the error terms for the two social trust variables (CE 3 and CE 4) being correlated. No residuals were greater than 2.000.

In finalSR3, the standardized pattern coefficients of the latent variables LIT, NUM, and TECH when regressed on the latent variable LLM were 0.192, -0.040, and 0.368 respectively. These values suggest that frequency of engaging in technology-related informal learning activities likely had the strongest effect on lifelong learning mindset, and when combined with the literacy-related informal learning indicators, had a moderate positive effect on LLM. The frequency of numeracy-related informal learning activities appeared to have a negative effect on LLM, although this effect was very weak. R^2 values for the latent variable LLM indicated that lifelong learning mindset explained a quarter of the variance in the final model (finalSR3 R^2 = 0.250).

The standardized pattern coefficient of the latent variable LLM when regressed on the latent variable CIVENG was 0.292 in finalSR3. The explanatory value of CIVENG in the final model was weak. In finalSR3, CIVENG accounted for 8.5% of the variance.

The R^2 values for all of the observed variables in the final model are shown in table 4.16, and the R^2 values for the latent variables are shown in table 4.17. The model diagram for finalSR3 is shown in figures 4.14.

Table 4.16

R-square Statistics for Observed Variables in the Final Structural Regression Model

Variable	R^2 finalSR3
ILA1	0.156
ILA2	0.358
ILA3	0.184
ILA4	0.366
ILA5	0.207
ILA6	0.491
ILA8	0.361
ILA9	0.442
LS1	0.513
LS2	0.683
LS3	0.483
LS4	0.408
LS5	0.403
LS6	0.431
CE1	0.100
CE2	0.282
CE3	0.057
CE4	0.109

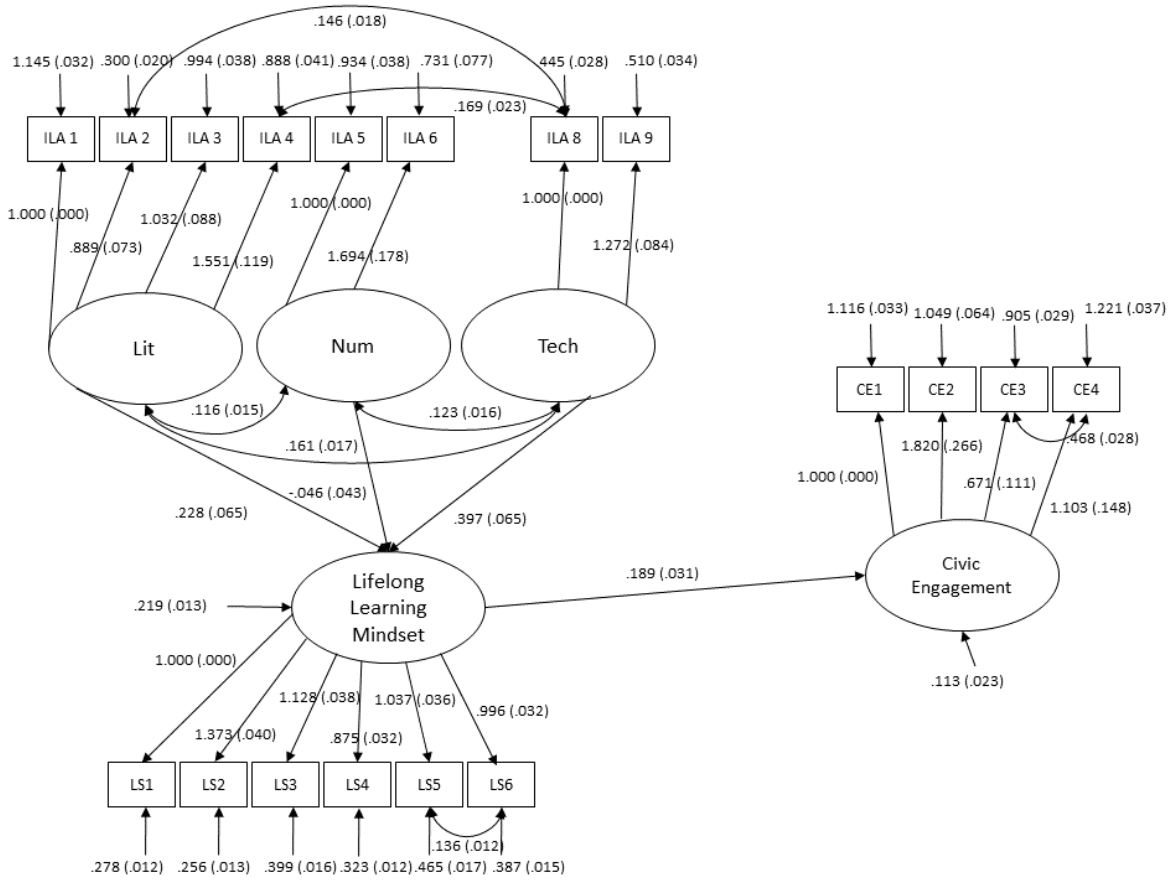
Table 4.17

R-square Statistics for Latent Variables in the Final Structural Regression Model

Variable	R^2 finalSR3
LLM	0.250
CIVENG	0.085

Figure 4.14

Model finalSR3: Path Diagram with Standardized Coefficients



Summary

This chapter documented the results of the two-step structural regression model testing that was specified in chapter three. It summarized the study's purpose and research questions. Descriptive statistics (frequency, mean, variance, correlation, and normality) were provided for the observed study variables. Global fit statistics were given for each tested model that produced admissible results. Local fit statistics for these models were shown in the form of model diagrams which displayed the standardized estimate (with standard error) for each indicator, as well as the residual variances (with standard error). The implication of these results will be discussed in chapter five.

CHAPTER 5

CONCLUSIONS

Introduction

This chapter discusses the findings from chapter four in relation to each research question and hypothesis tested in this study. These findings are used to draw conclusions about the research problem this study addressed. Implications for the theory of learning cities and recommendations for further research are given based on these findings.

Purpose of the Study

The purpose of this study was to construct a testable model for how everyday informal learning activities, such as reading a newspaper or using the Internet to find more information about issues, may influence one's lifelong learning mindset, as well as how this mindset affects three types of civic engagement: frequency of volunteerism, sense of political self-efficacy, and level of social trust. The intention of this study was to add to the theoretical understanding of how learning cities' promotion of lifelong learning may impact the types of positive social change that lead to individual empowerment and social inclusion.

Model Summary

The model built for this study was based on Rüber et al.'s (2018) theory of how adult learning influences civic participation. Specifically, this study theorized that increased frequency of informal learning will have a positive effect on lifelong learning mindset as learners gain skills through the everyday activities that shape their attitudes and beliefs about learning. This mindset then predisposes one to be more civically engaged as these attitudes and beliefs increase the frequency of volunteerism because one has the ability to use skills that can be of benefit to others. People who possess a lifelong learning mindset will tend to have more confidence in their

abilities (as indicated by their "comfort with getting to the bottom of difficult things" or inclination to "relate new ideas to real life situations"), which creates a greater sense of political self-efficacy and social trust. Because informal learning (INFLRN), lifelong learning mindset (LLM), and civic engagement (CIVENG) are constructs that are not directly measurable, they were treated as latent variables. Each of these latent variables were composed of directly observable variables (indicators) that served as evidence of the presence of the latent variable. All indicators were taken from a nationally representative secondary dataset, the Program for the Assessment of Adult Competencies (PIAAC). The INFLRN indicators (ILA) were the self-reported frequency of engaging in eight everyday learning activities, such as reading the newspaper or writing letters/email. The LLM indicators (LS) were the self-reported level of agreement with six statements about learning, such as "I enjoy learning new things." The CIVENG indicators (CE) were the self-reported frequency of volunteerism and the self-reported level of agreement with three statements about political self-efficacy and social trust, such as "People like me don't have any say about what the government does." This study used a two-step structural regression (SR) analysis to test a fully latent model: first, confirmatory factor analyses (CFA) to find the best model specification for each latent variable (INFLRN, LLM, and CIVENG), and second, using SR to examine the effect of INFLRN on LLM and INFLRN on CIVENG through LLM. Seven hypotheses were formed to test these models for the purpose of answering six research questions. Questions one through three pertained to the CFA models, questions four and five related to parts of the SR model, and question six concerned the full SR model.

Research Question 1 Discussion

Research question one asked what latent structure (for INFLRN) best explains the variability in response patterns related to frequency of everyday informal learning activities (ILA). Three hypotheses were tested using confirmatory factor analysis (CFA) models to answer this question: a one factor (H1), a three factor (H2), and a two factor (H2-1). The one-factor model was the least restrictive and assumed that all of the covariance in the frequency of the everyday learning activities was related to a common factor (informal learning). The three-factor model assumed that the INFLRN latent variable would be better explained if the indicators were correlated into groups for literacy-related activities (LIT), numeracy-related activities (NUM), and information and communication technology (ICT)-related activities (TECH). The two-factor model assumed that more explanatory value would come from grouping the indicators into two groups: literacy/ICT-related activities (LITECH) and numeracy-related activities (NUM).

Models H1 and H2-1 were rejected because they failed the exact fit test and other global fit statistics were not in an acceptable range (χ^2 [20] = 301.770, p = 0.000; RMSEA = 0.071; CFI = 0.597; SRMR = 0.214) and (χ^2 [19] = 188.756, p = 0.000; RMSEA = 0.056; CFI = 0.757; SRMR = 0.130). Local fit statistics for H1 also indicated poor explanatory value for most model variables. While local fit improved with H2-1, this model had comparable explanatory value with the three-factor model (H2), which had superior global fit (χ^2 [17] = 164.770, p = 0.000; RMSEA = 0.055; CFI = 0.789; SRMR = 0.104). Therefore, this study concludes that neither a one-factor nor a two-factor model using frequency of everyday learning activities from the PIAAC should be used to measure the variability of response patterns reliably. The H2c specification of the three-factor model (LIT, NUM, TECH) demonstrated reasonable global fit (χ^2 [15] = 83.271, p = 0.000; RMSEA = 0.040; CFI = 0.902; SRMR = 0.052) and was the only

specification to produce admissible results in the fully latent structural regression model; therefore, a three-factor model using frequency of everyday learning activities from the PIAAC was the most likely to measure the variability of response patterns reliably.

This study concluded that the three-factor model that segments informal learning indicators into literacy, numeracy, and ICT-related activities is the latent structure that best explains variability. Therefore, when analyzing the effects of informal learning it is important to categorize what type of skill domain the experience may be building, because this knowledge may provide more explanatory value for the effect. This finding supports the Rüber et al. (2018) model (that the current study is based on) that theorized adult learning positively affects one's ability to engage civically due to the increased knowledge and skills that are needed to participate, and that this path is conditional to the content of the learning. While Rüber and Janmaat (2021) later found that any lifelong learning (no matter the content) could increase frequency of volunteerism, that study operationalized adult education as participation in formal or nonformal training, not informal learning activities. The authors suggested that this effect could be due to the social connections that people make while taking a training class. However, the types of informal learning activities used in this study are typically self-directed and may or may not involve making social connections with others. Further evidence that the type and context of education matters is found in Galeshi and Bolin (2020) who used PIAAC prison study data to examine the effects of literacy and numeracy skills on political self-efficacy and social trust in the U.S. incarcerated population. They observed that numeracy skills had no effect and literacy skills had a negative effect on efficacy and trust, a finding they attributed to the possibility that "ability to read and comprehend literature results in a higher awareness of societal inequalities and a greater understanding of the barriers that are faced by many

individuals prior to their incarceration, during their incarceration, and after they are released" (Galeshi & Bolin, 2020, p. 10). Interestingly, the authors discovered that vocational training did positively affect political self-efficacy and social trust in this population, which contradicts Rüber and Janmaat's (2021) finding that work-related training had a slightly negative (although not significant) effect on volunteerism.

In model H2c, informal learning activities related to information communication technology (ICT) skills (ILA 8- using email) and literacy (ILA 2 - reading letters, memos, or email) were the best indicators of informal learning and explained 41.6% and 47.9% of the variance respectively. Newspaper reading has been used as a measure of civic participation (Vera-Toscano et al., 2017); however, it did not provide as much explanatory value in this study ($R^2 = 0.202$), accounting for less of the variance than any of the other ILA variables, except ILA 1 – read directions ($R^2 = 0.178$). These findings align with Demir-Basaran and Sesli (2019) who found that there was no significant relationship between reading the newspaper and lifelong learning mindset. On the other hand, the good explanatory value of ICT variables supports research that has found positive relationships between ICT, such as blogging, and civic engagement (Harju et al., 2016). This connection suggests that the communicative or communal aspects of ICT informal learning activities may be the reason for the impact, just as Rüber and Janmaat (2021) hypothesized it was the social nature of adult learning that increased volunteerism tendency.

Research Question 2 Discussion

Research question two asked what latent structure best explains the variability in response patterns related to level of agreement with statements about learning strategy. Three hypotheses were tested using CFA models to answer this question: a one factor (H3), a three

factor (H4), and a two factor (H5). The one-factor model was the least restrictive and assumed that all of the covariance in the level of agreement with statements related to learning strategy was related to a common factor (lifelong learning mindset). The three-factor model assumed that that better explanatory value could be provided by grouping the indicators into three correlated factors: motivation (MOTIVE), persistence (PERSIST), and self-directedness (SELFDIR), while the two-factor model grouped the indicators into two factors, a combined motivation/persistence (MOTPER) and SELFDIR. Because H4 (MOTIVE, PERSIST, SELFDIR) produced a latent variable covariance matrix that was not positive definite, it could not be used as an admissible solution. It was therefore rejected, and this study concluded that a three-factor model using level of agreement with statements about learning strategy from the PIAAC should not be used to measure the variability of response patterns reliably.

Both the H3 (one-factor) and the H5 (two-factor) models failed the exact fit test (χ^2 [9] = 217.575, p = 0.000) and (χ^2 [8] = 94.353, p = 0.000). However, H5 produced reasonable results on the other global fit tests (RMSEA = 0.062; CFI = 0.936; SRMR = 0.045). H3 was tentatively rejected because its mediocre global fit was not as good as H5. Model H5 was respecified using modification indices and the H5a specification was retained for use in the final structural regression model. However, when the SR model was not able to produce an admissible result with any specification of H5, another look was given to H3, which did have good local fit. The one-factor H3 model was respecified as H3a and demonstrated an acceptable global fit (χ^2 [7] = 92.685, p = 0.000; RMSEA = 0.066; CFI = 0.936; SRMR = 0.044). Model H3a was used as the specification for the latent variable LLM in the full SR model. Given the fit of H3 and H5, this study concluded that both a one-factor and two-factor model using level of agreement with statements about learning strategy from the PIAAC are likely to measure the variability of

response patterns reliably. However, because the two-factor model failed to produce an admissible result in any of the fully latent structural regression models in which it was specified, this study also concluded that a two-factor model could be used by itself as an acceptable measure, yet it may not be suitable for use as part of a larger, more complex SR model as it may be more likely to result in convergence errors. The one-factor model was the only specification that could produce reasonable, admissible results in the fully latent structural regression model used in this study.

The PIAAC background questionnaire only asks six questions related to learning strategy. All six items were used as indicators in this study of the latent variable lifelong learning mindset (LLM). Instruments specifically designed to measure LLM that use more than one factor tend to have between 17 and 72 items (Deakin Crick & Yu, 2008; Coşkun & Demirel, 2010; Gür-Erdogan & Arsal, 2015). The Lifelong Learning Mindset Questionnaire (Drewery, et al., 2020) has two factors, yet at least eight items. Furthermore, instruments that specify only one factor tend to have between 14-16 items (Kirby et al., 2010; Wielkiewicz & Meuwissen, 2014). Given the composition of these other validated instruments, it is possible that there are not enough items on the PIAAC to support more than a one-factor model without causing identification and convergence errors when used as part of a larger structural regression analysis.

Research Question 3 Discussion

Research question three asked to what extent civic engagement could be measured through factors related to volunteerism, political self-efficacy, and social trust. One hypothesis was tested using a CFA model to answer this question: a one-factor (H6). The model H6a specification was retained because it passed the exact fit test (χ^2 [1] = 0.009, p = 0.9236) and other global fit statistics were acceptable (RMSEA = 0.000; CFI = 1.00; SRMR = 0.000).

Therefore, this study concluded that a one-factor model using questions from the PIAAC related to volunteerism, political self-efficacy, and social trust, is likely a reliable measure of civic engagement. However, this assertion is based on the acceptable global fit of the CFA model. The local fit of the model was not ideal. Because the indicator variables had moderate to poor explanatory value (none of the pattern coefficients was above 0.7), this model should be used with caution. For example, political self-efficacy may provide good insight as it explained 30% of the variance, but volunteerism only explained 8%. The social trust indicators explained about 12% (CE3) and 21% (CE4). This variation could also be related to the difficulty of treating civic engagement as a single construct. Previous studies have demonstrated that individuals participate in different types of civic activities at different levels and frequencies. (Jennings & Zeitner, 2003; Oser, 2017). Likewise, other validated instruments designed to measure civic engagement have included between 14-28 indicators and multiple factors, which likely provide more a more comprehensive evaluation of civic engagement than this study's one-factor, four-indicator model (Doolittle & Faul, 2013; Talo & Mannarini, 2015).

The latent variable CIVENG (civic engagement) is an endogenous variable in this study. Similar to the other indicator variables in this study, it is measured through items taken from the PIAAC background questionnaire. These items were categorized as personal and social traits according to the PIAAC conceptual framework (OECD, 2011) and included on the PIAAC as a means of measuring factors that may be influenced through learning and skill development. One challenge of using the PIAAC dataset to measure civic engagement as one latent variable was the phrasing of the questions used on the background survey. Four questions from the PIAAC were used as indicators of civic engagement in this study's model. One of the indicators, CE 1, asked about frequency of an activity over the previous twelve months (volunteerism), yet the other

three indictors, CE 2-4, were point-in-time measures of attitudes (i.e., how much respondents agreed or disagreed with statements about their own political self-efficacy and level of social trust on the day the survey was taken). If one assumes that the participants were truthful and that their answers were reflective of their feelings at the time of the survey, these feelings could reasonably be attributed as the outcome of activities that had occurred during the prior twelve months or before. Consequently, a stronger argument exists that CE 2, CE 3, and CE 4 could be causal effects of informal learning activities that occurred in the past, than exists for CE 1 which may have been happening simultaneously with the informal learning indicators. Furthermore, the PIAAC conceptual framework states, "Civic engagement is a social outcome but can also be seen as an opportunity for informal learning" (OECD, 2011, p. 46), which implies a potential non-recursive relationship between civic engagement and informal learning. In fact, Yu et al. (2019) used PIAAC data to observe that volunteerism was the strongest predictor of learning outcomes in the U.S. and Canada. However, this relationship was not modelled in the current study in an effort to reduce the model complexity and avoid the need for an even larger sample (which was not available given this study used secondary data). As Kline (2016) noted, several conditions may result in the need for larger sample sizes: complex models with more parameters, variables with severely non-normal distributions, and factors with few indicators. All three of these considerations were present in this study.

Research Question 4 Discussion

One fully latent structural regression model (finalSR) was constructed to answer questions four, five, and six. Model finalSR3 was retained to answer those questions because it was the only SR model tested that had admissible results and a moderately acceptable global fit (χ^2 [124] = 659.570, p = 0.000; RMSEA = 0.039; CFI = 0.810; SRMR = 0.142). Model finalSR3

specified a three-factor informal learning component (LIT, NUM, TECH), a one-factor lifelong learning mindset variable (LLM), and a one-factor civic engagement variable (CIVENG). Research question four asked what the relationship was between frequency of informal learning activities and lifelong learning mindset. Question four pertains to the LIT, NUM, TECH on LLM paths in the structural regression model. The standardized pattern coefficient for LIT on LLM showed that a one standard deviation change in the frequency of the literacy-related informal learning activities resulted in a 0.192 ($p = 0.000$) standard deviation increase in lifelong learning mindset, which indicated a significant, positive effect. The standardized pattern coefficient for NUM on LLM showed that a one standard deviation change in the frequency of the numeracy-related informal learning activities resulted in a -0.040 ($p = 0.309$) standard deviation increase in lifelong learning mindset, which indicated an inverse effect that is not significant. The standardized pattern coefficient for TECH on LLM showed that a one standard deviation change in the frequency of the ICT-related informal learning activities resulted in a 0.368 ($p = 0.000$) standard deviation increase in lifelong learning mindset, which indicated a significant, positive effect.

This study concluded that there is a positive, significant relationship between the frequency of literacy and ICT-related informal learning activities and lifelong learning mindset, and an inverse, non-significant relationship between the frequency of numeracy-related informal learning activities and lifelong learning mindset. ICT-related informal learning activities showed the greatest direct effects on LLM, which supports Öteleș'(2020) finding that lifelong learning tendency is a significant predictor of digital literacy, and Haseski et al.'s (2014) discovery of a slight positive correlation between Facebook usage and LLM for the motivation and persistence factors. Consequently, people who use the Internet to find information and use email more

frequently than others are more likely to identify with the common characteristics of lifelong learners (as defined by the PIAAC learning strategies questions). They enjoy learning new things, have no difficulty in relating new ideas to real-life applications or to already known concepts, strive to get to the bottom of difficult problems, savor figuring out how ideas fit together, and never hesitate to seek out more information when they do not understand something. To a lesser extent, these same LLM traits are more likely to be found in people who frequently read and write letters, read the newspaper, and read directions. People who frequently read financial statements or calculate costs do not seem to exhibit more LLM characteristics than average, and some may display fewer.

The latent variables, LIT, NUM, and TECH are exogenous variables in this study. They are a measure of informal learning based on the PIAAC conceptual framework's (OECD, 2009) assumption that engaging in everyday activities that are related to specific types of knowledge (literacy, numeracy, and ICT) likely results in developing and maintaining skills in those domains. The latent variable, LLM, is an endogenous variable in this study. The indicators of LLM are a measure of the presence of personal traits related to meta-cognition (OECD, 2011). This study provided evidence to support a positive relationship between TECH and LLM, and also LIT and LLM, which supports the PIAAC conceptual framework. The PIAAC designers acknowledged the importance of informal learning on skills development by including questions about "everyday activities" on the background questionnaire (OECD, 2009). However, Tsatsaroni and Evans (2014) cautioned that lifelong learning activities are not experienced on a continuum by all adult learners. Tsatsaroni and Evans (2014) criticized the use of global assessments like the PIAAC by "supranational" organizations like OECD for their tendency to promote a "more radical idea of lifelong learning" that treat numeracy as a "narrow competency"

rather than “powerful knowledge” (p. 167). They theorized that surveys like the PIAAC “may contribute to and augment social reproduction of existing divisions and inequalities, rather than help to change and progress towards a learning society” (p. 180). This assertion is based on the unequal types of lifelong learning available to adults, which may yield unequal outcomes. For example, less advantaged adults may be more likely to perceive themselves as failures who need continual retraining simply to survive, while more advantaged adults already perceive themselves as successes who make use of continuing education to increase their knowledge to thrive. Perhaps, evidence of this inequality is present when comparing the effects of frequency of everyday activities that encourage more creative and thoughtful use of knowledge (such as ICT-related activities), to the more “narrow” numeracy-related activities in this study (reading financial statements and calculating costs). This inequality was observed by Cummins and Kunkel (2015) who found that workers in the U.S. with less formal education had less access to and were less likely to participate in lifelong learning when compared to adults with college degrees. Furthermore, Murray et al. (2016) used PIAAC data to demonstrate that people engaged in jobs that require less complex skill use quickly begin to lose some of the literacy skill gains they achieved through formal education, and that this loss is significant and pronounced even for people with a college degree. Everyday skills use at work and at home matters.

Regarding the potential negative effect of numeracy-related informal learning activities on LLM, it is important to note that only two of the eight informal learning activities (ILA) were related to numeracy skills: ILA 5 (Read bills, invoices, bank statements or other financial instruments) and ILA 6 (Calculate prices, costs or budgets). It is possible that these two skills are not representative of the types of numeracy activities that are likely to build LLM. These activities are more procedural and less likely to inspire one’s creativity or motivation for

learning, which could also explain why the literacy-related ILA 1 (read directions) had the least amount of positive effect on LLM compared to the other LIT and TECH indicators.

Research Question 5 Discussion

Research question five asked what the relationship was between lifelong learning mindset and civic engagement. The finalSR3 model was also used to answer this question. The relevant path is LLM on CIVENG. The standardized pattern coefficient for this path showed that for every one standard deviation increase in lifelong learning mindset, the civic engagement factor increases by 0.292 ($p = 0.000$), which indicated a significant, positive effect. This model also indicated that lifelong learning mindset explains 25% of the variance in the model. This study concluded that lifelong learning mindset has a positive, significant effect on civic engagement.

Other studies have demonstrated that factors such as socio-economic status, gender, age, and race influence the variability in frequency of volunteerism and self-reported feelings about political self-efficacy and social trust (Gonzales et al., 2016; Schoon & Cheng, 2011). Given that these factors were not included in this study, this percent attributable to lifelong learning mindset alone appears notable.

Research Question 6 Discussion

Research question six asked what the effect of frequency of informal learning was on civic engagement (CIVENG) mediated by lifelong learning mindset. The full finalSR3 model was used to answer this question. The ICT-related informal learning variable (TECH) had the largest indirect effect on CIVENG (0.107, $p = 0.000$). The indirect effect of literacy-related informal learning (LIT) on CIVENG was 0.056 ($p = 0.000$). The indirect effect of the numeracy-related informal learning variable (NUM) was negative, small, and not significant (-0.040, $p = 0.309$). When combined with the direct effect of lifelong learning mindset (LLM) on CIVENG

(0.292, p = 0.000), the total effect of TECH on CIVENG was 0.399. The total effect of LIT on CIVENG was 0.348. This study concluded that the frequency of informal learning activities related to ICT skills is positive, significant, and mediated by LLM. As the frequency of engaging in ICT activities increases, the presence of civic engagement behaviors and traits increases. This effect is mediated by the direct effect of LLM on CIVENG, which means that as the frequency of engaging in the informal learning activities, "using email" and the "using the Internet to find information" increases, one's tendency towards a lifelong learning mindset increases, which then increases the frequency of volunteering and feelings of being empowered to effect change and the ability to trust other people. A positive, significant effect was also found for LIT on CIVENG. This effect is also mediated by LLM, which means that as one uses literacy skills to perform everyday tasks such as reading and writing letters, reading directions, and reading the newspaper more frequently, the tendency towards displaying lifelong learning traits increases, which increases one's attitudes towards and participation in civic engagement. Because the indirect effect of the numeracy-related variable was not significant, it was not used to calculate a total effect. This study concluded that the indirect and total effects of the frequency of informal learning activities related to numeracy-skills is very minimal and inverse. If any effect exists, it is likely that as one reads bills or calculates a budget more often, the likelihood of developing a lifelong learning mindset that leads to acts of civic engagement may slightly decrease. Overall, these findings provide empirical evidence to support the Rüber et al. (2018) conceptual model that theorized adult learning increases civic participation through affecting the low-level personality traits that make one more inclined to take civically-related actions.

The positive significance of literacy and ICT-related activities is supported by Jennings and Zeitner (2003) who found a positive significant correlation between Internet use and both

volunteerism and social trust, as well as Boyd et al. (2011) who demonstrated a positive relationship between reading the newspaper and using the Internet with civic engagement. These positive relationships are further supported by the United Nations Educational Scientific and Cultural Organization's (UNESCO) policy of using ICT to promote lifelong learning. UNESCO maintains a database, the Effective Literacy and Numeracy Practices Database (LitBase) of case studies of country-led initiatives that used ICT to teach citizens in informal settings. The organization states that enabling connectivity leads to information exchange between citizens about "important day-to-day topics" and the coordination of "their community development activities" (UNESCO, 2016, p. 10).

As for the possible negative effect of numeracy-related informal learning activities on civic engagement, it is worthwhile to note that NUM indictors used in this study may not represent the type of numeracy skills required for civic participation. According to the National Center for Educational Statistics (NCES), which administered the 2017 PIAAC in the U.S., just over one third of participants scored at least at Level 3 in numeracy, the level defined as "proficient" (NCES, n.d.). Approximately one third scored at Level 1 or below, which indicates a person who struggles to process simple mathematical concepts or may be innumerate. This issue was presented by Phillips (2007) in a comparative study of U.S. states' performance on standardized math tests with other countries' that found extremely low levels of proficiency in U.S. citizens. Phillips cautioned that "[i]n a democracy, a critical mass of the general population needs to grasp complex concepts in sufficient detail to make informed societal decisions" (2007, p. 5). It may be likely that activities such as reading bills and calculating prices neither builds the level of numeracy required for interest in civic participation, nor imbues one with sufficient political self-efficacy or social trust.

Implications for Learning City Theory

This study was inspired, in part, by Boshier's (2018) call for scholars in adult education to build more theory around the concept of learning cities, such as examining the factors that determine the progress of learning cities and exploring the role of informal learning. The results of this study suggested that there is a positive relationship between informal learning and civic engagement, which is strengthened through the formation of a lifelong learning mindset. This finding emphasizes the role that informal learning can play in learning cities which was also demonstrated by Buchczyk and Facer (2018). A city that ignores how citizens use their skills to navigate their daily lives may not fully capture the benefits of implementing the learning cities framework.

As ICT-related informal learning seemed to have the greatest impact, learning city organizers may want to focus their efforts on communicating with citizens through email and texts, as well as providing more opportunities for residents to communicate with each other, sharing their own ideas and learning through videos, blogs, and social media. In fact, Dennis (2015) defined blogs as spaces of public pedagogy where "people go to learn with and through interested others" (p. 6). Harju et al. (2016) observed that bloggers in Finland viewed the activity as a "form of self-actualization that is driven by a comprehensive need to participate in the world" (p. 13). One technique of using ICT to successfully engage with citizens was documented through the use of a MOOC (massively open online course) to teach concepts about smart cities with the intention of encouraging more civic engagement. Hudson, et al. (2019) found that the MOOC did result in positive attitudinal and behavioral changes in the adult learners in the study; however, few participants continued to apply what they had learned due to a lack of opportunity for true engagement in their communities. The authors suggested that city policy makers should

be mindful that when citizens have transformative learning experiences, they also need ways to "transform their learning into action" (Hudson, et al., 2019, p. 45).

Two of the indicators of LLM used in this study, LS4 "I like to get to the bottom of difficult things" and LS3 "When I come across something new, I try to relate it to what I already know," could be used to inform communication with citizens, altering it from the typical monologue to a perhaps more effective dialogue. For instance, rather than simply asking for suggestions about how to solve problems the city is facing, learning city organizers could encourage citizens to show examples of their solutions and offer ways for other citizens to provide feedback on those solutions. Bakht et al. (2018) presented a method of analyzing citizens' Twitter "tweets" to crowdsource a definition of sustainability regarding local transportation projects. Another ICT technique that has been useful in motivating citizens and encouraging them to relate learning to real-life applications is gamification (Vanolo, 2018). Serious games, such as JouleBug (JouleBug, 2022) provide "challenges" to participants by giving them everyday tasks to perform that can lead to improvements in the environment, civic engagement, and overall well-being. The nonprofit, Games for Change, has created and facilitated games (both digital and nondigital) as social impact mechanisms since 2004 (Games for Change, 2022). The organization has currently documented more than 175 games.

This study did show a positive relationship between informal learning and civic engagement; however, it is worth noting that while participants reported high frequencies of informal learning and high agreement with lifelong learning mindset, they also reported extremely low levels of volunteerism, political self-efficacy, and social trust. This finding should be of concern to learning city organizers because it suggests that citizens can be engaging in high rates of lifelong learning and possess a lifelong learning mindset, yet still have very low opinions

of their government and feel disengaged from their community. Rüber et al. (2018) hypothesized that people volunteered because they could afford to give away their labor for free and/or had the knowledge to contribute something valuable. However, this study demonstrated that political self-efficacy explained most of the variance in civic engagement traits. Perhaps the path to increased civic engagement lies not only in lifelong learning to acquire skills, but also in providing real opportunities for engagement that demonstrate to citizens their contributions will be accepted and valued, which was also noted by Hudson et. al. (2019). On the other hand, low levels of civic engagement among lifelong learners may be related to the government itself. Popović et al. (2020) provided an alternative perspective on the relationship between learning cities and civic engagement. The authors criticized the default notion that a city's government and policy makers should play the defining role in learning cities. They described "Rebel Cities" in the global South and Eastern Europe where citizens and nongovernmental organizations have placed learning at the heart of their activities, yet distrust of authoritarian governments and their state-controlled educational institutions have kept them from following traditional approaches to lifelong learning. Sometimes citizen mistrust of government is warranted and while they may have high levels of LLM, they will not engage civically for their own protection. To a lesser extent, this situation could also apply to certain subgroups in the U.S.

Recommendations for Further Research

This study determined that data from the PIAAC can be used as a reliable measure of lifelong learning mindset. Much of the literature on measuring LLM discusses differences in LLM based on gender. Specifically, studies using validated instruments to measure LLM have found that this characteristic is stronger in females (Sezen-Gultekin & Gür Erdogan, 2016; Kilinç & Uzun, 2020; Tezer & Aynas, 2018). This study did not introduce gender as a variable;

however, the appropriate data is available in the PIAAC dataset to test the effects of this variable. This analysis would be a worthwhile extension of this study as the U.S. Bureau of Labor Statistics (2016) reported that adult females are more likely to volunteer than males (27.8% to 21.8%). Furthermore, the preferred types of volunteering differed by gender. Men tended to provide general labor (12.3%) or coach sports teams (9.3%), while women worked with food service (12.9%), did tutoring (10.6%), or fundraised (9.9%). These activities could be compared with the frequency of informal learning activities by type and gender.

Given that one of the primary purposes of the PIAAC is to provide a reliable method of comparing the performance of citizens across the OECD member countries, it is recommended that the models from this study be tested using populations from the other OECD countries. Several studies using PIAAC data have chosen to compare the U.S. to Germany (Rose et al., 2019) or Canada and New Zealand (Yu et al., 2019) as these countries have been determined to have comparable populations. Further comparative research, such as Liu's (2019) study that used PIAAC data to contrast adults in the U.S., Germany, and South Korea with low numeracy skills could focus on countries known to be different from the U.S. in an effort to make the results of this study more generalizable to the global learning cities framework.

This study was limited by the types of data that the PIAAC collected. While the learning strategies questions from the PIAAC background questionnaire were adequate measures of LLM, a more specific tool would yield better model results. Likewise, the CIVENG variable had good global fit with the data, but weak explanatory value when looking at local fit. This variable would benefit from the use of an instrument validated to measure civic engagement. It is recommended that these models be tested using other sources of data and more specialized instruments such as the Lifelong Learning Tendency Scale (Coşkun & Demirel, 2010), the

Lifelong Learning Scale (Kirby et al., 2010), the WielkiewiczLLS (Wielkiewicz & Meuwissen, 2014), the Participatory Behaviors Scale (Talo & Mannarini, 2015), and the Civic Engagement Scale (Doolittle & Faul, 2013).

Finally, this study focused on the informal learning activities that a majority of participants engaged in at least weekly. This criterion was chosen to create a snapshot of the "already existing learning city;" however, it greatly reduced the diversity of the types of informal learning that could be represented in this study's models. For example, the PIAAC background survey asks six questions related to numeracy skills used in everyday life, yet this study only included two ("read financial statements" and "calculate costs"). The effect of other activities, such as frequency of using a calculator, using fractions or percentages, preparing simple charts, and using simple algebra or formulas might have better represented the numeracy factor that in this study was not shown to have a significant effect. Furthermore, the frequency of more advanced literacy and ICT skills such as reading professional journals, writing articles and reports, using spreadsheets, and using programming languages may demonstrate different effects than the lower-level skills included in this study, such as reading letters or using email. This differentiation based on task difficulty could be used to confirm Murray et al.'s (2016) finding that when people use primarily low-level skills at home and work, their overall literacy competency decreases over time. Given the results of this study, reduced literacy could also lead to decreases in LLM and civic engagement. Additional models could be specified to compare the PIAAC's "skills use in everyday life" items by the level of difficulty required for that activity. This type of analysis may shed light on the threshold for being able to engage civically in meaningful ways.

Summary

This study provided an empirical test of one path in the Rüber et al. (2018) conceptual model of how adult learning impacts civic participation. The selected path (adult learning affects low-level personality traits which result in increased civic participation) was modeled in this study using latent variables for informal learning, lifelong learning mindset, and civic engagement and tested using a nationally representative secondary dataset. The structural regression model used in this study was a step towards transforming the original conceptual model into a causal model that can be analyzed quantitatively and generalized to the U.S. population. The current study also expanded the scope of the Rüber model through its emphasis on informal adult learning, which was not accounted for as a unique type of adult learning in the Rüber conceptual model.

The conclusions in this chapter can be used to inform learning city theory and to further the dialogue on how informal learning affects civic engagement through lifelong learning mindset in the "already existing" learning city. An increased awareness of how everyday activities influence learning abilities, beliefs, and behaviors can help both citizens and policy makers take a critical look at the habits many may take for granted. These mostly unexamined actions are what create human systems, such as cities, and are where the opportunities for changing those systems may be found.

Belzer (2017) noted that "PIAAC data probably cannot be used to point out effective program and policy interventions, although they can spur [one] to action by highlighting the failings of the system" (p. 118). Her observation is based on Berwick's (2003) assertion that in the healthcare field, it is the design of a system that produces an outcome, "not simply the will, native skill, or attitude of the people who work in that system" (p. 448) and consequently, "the

most effective route to improvement is through changing systems, not yelling at them" (p. 449). If a city wishes to apply the learning city framework in pursuit of greater civic engagement, providing opportunities for lifelong learning may not be sufficient. It may be necessary to analyze the current systems present in the community to identify where blockages to civic engagement occur. These blockages could then be targeted with specific learning interventions from nonformal trainings to campaigns to encourage informal learning habits known to alleviate the identified obstacles. Plentiful options for meaningful engagement that allow citizens to use higher-level skills more frequently are vital to this systemic change.

References

AIR PIAAC Team. (2019). *What You Need to Consider Before Working with PIAAC Data*. http://piaacgateway.com/s/WorkingWithPIAACData_updated-092816.pdf

Aksoy, H., Ebay, H., Kör, H., & Engin, M. (2017). Investigation of the lifelong learning tendency of college students. *Universal Journal of Educational Research, 5*(12A), 19-25. DOI: 10.13189/ujer.2017.051304

Akyol, B. (2016). Teacher self-efficacy perceptions, learning oriented motivation, lifelong learning tendencies of candidate teachers: A modeling study. *Eurasian Journal of Educational Research, 66*. 19-34. DOI: 10.14689/ejer.2016.65.02

Bakht, M. N., El-Diraby, T. E., & Hosseini, M. (2018). Game-based crowdsourcing to support collaborative customization of the definition of sustainability. *Advanced Engineering Informatics, 38*, 501-513. https://doi.org/10.1016/j.aei.2018.08.019

Belzer, A. (2017). Reflections on the PIAAC literacy and numeracy frameworks. *Adult Learning, 28*(3), 118-120. DOI: 10.1177/1045159516655150

Berwick, D. M. (2003). Improvement, trust, and the healthcare workforce. *Qual Saf Health Care, 12*, 448-452. https://www.ncbi.nlm.nih.gov/sites/ppmc/articles/PMC1758027/pdf/v012p00448.pdf

Beytekin, O. F. & Kadi, A. (2014). Quality of faculty life and lifelong learning tendencies of university students. Higher Education Studies, 4(5), 28-36. http://dx.doi.org/10.5539/hes.v4n5p28

Biao, I. (2013). The place of transformative learning in the building of learning cities in Africa. *Journal of Adult and Continuing Education, 19*(1), 3-16. http://dx.doi.org/10.7227/JACE.19.1.2

Biesta, G. & Cowell, G. (2012). How is community done? Understanding civic learning through psychogeographic mapping. *International Journal of Lifelong Learning, 31*(1), 47-61. DOI: http://dx.doi.org/10.1080/02601370.2012.636587

Boshier, R. (2018). Learning cities: fake news or the real deal? *International Journal of Lifelong Education*, *37*(4), 419-434. DOI: 10.1080/02601370.2018.1491900

Boyd, M. J., Zaff, J. F., Phelps, E., Wiener, M. B., & Lerner, R. M. (2011). The relationship between adolescents' news media use and civic engagement: The indirect effect of interpersonal communication with parents. *Journal of Adolescence, 34*, 1167-1179. doi:10.1016/j.adolescence.2011.07.004

Brown, T. K. (ed.). (1936) *Adult Education for Social Change: A Handbook for Leaders and Members of Discussion Groups, Forums, and Adult Classes*. Philadelphia: Social Order Committee, Swarthmore Seminar.

Buchczyk, M. and Facer, K. (2018). Exploring lifelong learning in the everyday city. *Widening Participation and Lifelong Learning, 20*(1), 199-206.

Campagna, D., Caperna, G., & Montalto, V. (2020). Does culture make a better citizen? Exploring the relationship between cultural and civic participation in Italy. Social Indicators Research, 149, 657-686. https://doi.org/10.1007/s11205-020-02265-3

Campbell, D. E. (2006, March 23-24). *What is education's impact on civic and social engagement?* Symposium on Social Outcomes of Learning, held at the Danish University of Education, Copenhagen.

Candy, P.C., Crebert, G., & O'Leary, J. (1994) *Developing lifelong learners through undergraduate education*. Australian National Board of Employment, Education and Training.

Carr, A., Balasubramanian, K., Atieno, R., & Onyango, J. (2018). Lifelong learning to empowerment: beyond formal education. *Distance Education, 39*(1), 69-86. DOI: 10.1080/01587919.2017.1419819

Cerasoli, C. P., Alliger, G. M., Donsbach, J. S., Mathieu, J. E., Tannenbaum, S. I., & Orvis, K. A. (2018). Antecedents and outcomes of informal learning behaviors: A meta-analysis. *Journal of Business Psychology, 33*, 203-230. DOI 10.1007/s10869-017-9492-y

Chickering, A. W. (2008). Strengthening democracy and personal development through community engagement. *New Directions for Adult and Continuing Education, 118*, 87-95. doi: 10.1002/ace.298

Christie, M., Carey, M., Robertson, A., & Grainger, P. (2015). Putting transformative learning theory into practice. *Australian Journal of Adult Learning, 55*(1), 9-30.

City of Vancouver. (2021). *Lifelong learning*. https://vancouver.ca/people-programs/lifelong-learning.aspx

Cordie, L., Rhodes, C., Adelino, L., & Wooten, M. (2021). Professional development and lifelong learning: Analyzing 21st century problem-solving skills in the U.S. workforce. *COABE Journal, 10*(1), 23-37. https://coabe.org/coabe-journal/

Coşkun, Y. D. & Demirel, M. (2010). Lifelong learning tendency scale: The study of validity and reliability. *Procedia Social and Behavioral Sciences, 5*, 2343-2350. DOI: 10.1016/j.sbspro.2010.07.461

Cranton, P. & Taylor, E. W. (2012). Transformative learning theory: Seeking a more unified theory. In E. W. Taylor, P. Cranton, & Associates (Eds.), *The handbook of transformative learning: Theory, research, and practice* (pp. 3-20). Jossey-Bass.

Cummins, P. & Kunkel, S. (2015). A global examination of policies and practices for lifelong learning. *New Horizons in Adult Education & Human Resource Development, 27*(3), 3-17.

Deakin Crick, R. & Yu, G. (2008). Assessing learning dispositions: Is the *Effective lifelong learning inventory* valid and reliable as a measurement tool? *Educational Research, 50*(4), 387-402. https://doi.org/10.1080/00131880802499886

Demir-Basaran, S., & Sesli, C. (2019). Examination of primary and middle school teachers' lifelong learning tendencies based on various variables, *European Journal of Educational Research, 8*(3), 729-741. https://doi.org/10.12973/eu-jer.8.3.729

Dennis, C. A. (2015). Blogging as public pedagogy: Creating alternative educational futures. *International Journal of Lifelong Education, 34*, 284–299. doi:10.1080/02601370.2014.1000408

Desjardins, R. (2020). PIAAC thematic review on adult learning. *OECD Education Working Papers No. 223*, https://doi.org/10.1787/864d2484-en

Delors, J., Al Mufti, I., Amagi, I., Carneiro, R., Chung, F., Geremek, B., Gorham, W., Kornhauser, A., Manley, M., Padrón Quero, M., Savané, M., Singh, K., Stavenhagen, R., Suhr, M. W., & Nanzhao, Z. (1996). *Learning, the treasure within: Report to UNESCO of the International Commission on Education for the Twenty-first Century*. UNESCO.

Derrick, M. G. (2003). Creating environments conducive for lifelong learning. *New Directions for Adult and Continuing Education, 100*, 5-18.

Dirkx, J. M., Mezirow, J., & Cranton, P. (2006). Musings and reflections on the meaning, context, and process of transformative learning: A dialogue between John M. Dirkx and Jack Mezirow. *Journal of Transformative Education*, *4*(2), 123-139.

Doolittle, A. & Faul, A. C. (2013). Civic engagement scale: A validation study. *SAGE Open, 3*(3),1-7. DOI: 10.1177/2158244013495542

Drewery, D. W., Sproule, R., & Pretti, T. J. (2020). Lifelong learning mindset and career success: Evidence from the field of accounting and finance. *Higher Education, Skills, and Work-Based Learning, 10*(3), 567-580. DOI 10.1108/HESWBL-03-2019-0041

Ekşi, H., Özgenel, M., & Metlilo, E. (2020). The effect of motivation success of university students on personal-professional competence: Mediation role of lifelong learning tendency. *International Journal of Evaluation and Research in Education, 9*(3), 583-593. DOI: 10.11591/ijere.v9i3.20664

Elfert, M. (2015). UNESCO, the Faure report, the Delors report, and the political utopia of lifelong learning. *European Journal of Education, 50*(1), 88-100. DOI: 10.1111/ejed.12104

Elfert, M. (2019). *UNESCO's utopia of lifelong learning: An intellectual history*. Routledge.

Elfert, M. (2020). Revisiting the Faure and the Delors report: Why was UNESCO's utopian vision of lifelong learning an unfailure? In F. Finnegan & B. Grummel (Eds.) *Power and possibility: Adult education in a diverse and complex world* (17-25). Brill. https://doi.org/10.1163/9789004413320_002

Faure, E., Herrera, F., Kaddoura, A., Lopes, H., Petrovsky, A. V., Rahnema, M., & Ward, F. C. (1972). *Learning to be: The world of education today and tomorrow*. UNESCO.

Fitzgerald, H.E. & Zientek, R. (2015). Learning cities, systems change, and community engagement scholarship. *New Directions for Adult and Continuing Education*, *145*, Spring, 21-33. DOI: 10.1002/ace.20120

Galeshi, R. & Bolin, R. M. (2020). The influence of correctional education, skill proficiency, and lifelong learning on social outcomes of incarcerated individuals: Results from PIAAC. *The Social Science Journal*, 1-15. https://doi.org/10.1016/j.soscij.2019.09.007

Games for Change. (2022). *Games for Change*. https://www.gamesforchange.org/

Gonzales, E., Shen, H., Sprague Martinez, L., & Norstrand, J. (2016). Race and place: Exploring the intersection of inequity and volunteerism among older black and white adults. *Journal of Gerontological Social Work, 59*(5), 381-400. 381-400, DOI: 10.1080/01634372.2016.1224787

Gunnlaugson, O. (2007). Shedding light on the underlying forms of transformative learning theory: Introducing three distinct categories of consciousness. *Journal of Transformative Education, 5*(2), 134-151. DOI: 10.1177/1541344607303526

Gür Erdogan, D. & Arsal, Z. (2015). The development of lifelong learning trends scale (LLLTS). *Sakarya University Journal of Education, 6*(1), 114-122. DOI: http://dx.doi.org/10.19126/suje.32361

Harju,V., Pehkonen, L., & Niemi, H. (2016). Serious but fun, self-directed yet social: blogging as a form of lifelong learning. *International Journal of Lifelong Education, 35*(1), 2-17. DOI: 10.1080/02601370.2015.1124930

Haseski, H. I., Şahin, Y. L., Yilmaz, E, & Erol, O. (2014). The investigation of the relationship between lifelong learning tendencies and aims of using Facebook. *Journal of Theory and Practice in Education, 10*(2), 331-351.

Henthorn, T. (2014). Experiencing the city: experiential learning in urban environments. *Journal of Urban History*, 40(3), 450-461.

Hudson, L., Wolff, A., Gooch, D., van der Linden, J., Kortuem, G., Petre, M., ten Veen, R., O'Connor-Gotra, S. (2019). Supporting urban change: Using a MOOC to facilitate attitudinal learning and participation in smart cities. *Computers & Education, 129*, 37-47. https://doi.org/10.1016/j.compedu.2018.10.012

Imel, S. (2012). Civic engagement in the United States: Roots and branches. *New Directions for Adult and Continuing Education, 135*, 5-13. DOI: 10.1002/ace.20021

Jacobs, J. (1992). *The death and life of great American cities*. Vintage Books. (Original work published 1961)

Jarvis, P. (2008). *Democracy, lifelong learning, and the learning society*. Routledge.

Jennings, M. K. & Zeitner, V. (2003). Internet use and civic engagement. *Public Opinion Quarterly, 67*, 311-334. 0033-362X/2003/6703-0001

Jones, R. (2010). Learning cities: what do people think? Summary of a case study. In N. Longworth & M. Osborne (Eds.), *Perspectives on Learning Cities and Regions: Policy, Practice, and Participation* (pp. 323-354). Leicester, UK: National Institute of Adult Continuing Education.

JouleBug. (2022). *Joule Bug Enterprise*. https://enterprise.joulebug.com/

Kallen, D. and Bengtsson, J. (1973). *Recurrent education: A strategy for lifelong learning*. OECD Publications Center. https://eric.ed.gov/?id=ED083365

Kang, D. J. & Cho, S. (2017). Lost in travel or a different conception? (Mis-)appropriation of transformative learning theory in the Republic of Korea. *Asia Pacific Education Review, 18*, 163-174. DOI 10.1007/s12564-017-9481-x

Kaya, K. (2020). Examining the lifelong learning tendencies of sport sciences faculty students. *Journal of Education and Learning, 9*(3), 99-105. https://doi.org/10.5539/jel.v9n3p99

Kaygin, H., Yilmaz, E., & Semerci, Ç. (2017). The relation between lifelong learning tendency and educational philosophies. *Universal Journal of Educational Research, 5*(12A), 121-125. DOI: 10.13189/ujer.2017.051318

Kearns, P. (2012). Learning cities as healthy green cities: building sustainable opportunity cities. *Australian Journal of Adult Learning*, *52*(2), 368-391.

Kilinç, M. & Uzun, K. (2020). The predictor role of the search for meaning in life in the determination of high school students' lifelong learning tendencies. *International Journal of Psychology and Educational Studies, 7*(3), 89-100. http://dx.doi.org/10.17220/ijpes.2020.03.009

Kirby, J. R., Knapper, C., Lamon, P., & Egnatoff, W. J. (2010). Development of a scale to measure lifelong learning. *International Journal of Lifelong Education, 29*(3), 291-302.

Kitchenham, A. (2008). The evolution of John Mezirow's transformative learning theory. *Journal of Transformative Education, 6*(2), 104-123. DOI: 10.1177/1541344608322678

Kline, R. B. (2016). *Principles and practice of structural equation modeling*. Guildford Press.

Knapper, C. K. & Cropley, A. (2000). *Lifelong learning in higher education* (3rd ed.). Kogan Page.

Kozikoglu, I. & Onur, Z. (2019). Predictors of lifelong learning: Information literacy and academic self-efficacy. *Cypriot Journal of Educational Science, 14*(4), 492-506. https://doi.org/10.18844/cjes.v11i4.3460

Kwon, I.T., and Schied, F. M. (2009). Building communities into lifelong learning cities: the case of the Republic of Korea. *Adult Education Research Conference*. https://newprairiepress.org/aerc/2009/papers/35

Lai, H., Wu, M., & Li, A. (2011). Adults' participation in informal learning activities: Key findings from the adult education participation survey in Taiwan. *Australian Journal of Adult Learning, 51*(3), 409-432.

Liu, H., Fernandez, F., & Grotlüschen, A. (2019). Examining self-directedness and its relationship with lifelong learning and earnings in Yunnan, Vietnam, Germany, and the United States. *International Journal of Educational Development, 70*, 1-8. DOI: https://doi.org/10.1016/j.ijedudev.2019.102088

Longworth, N. (2006). Learning cities, learning regions, learning communities: lifelong learning and local government. London: Routledge.

Lowell City of Learning. (2021). *Lowell as a city of learning*. https://lowellcityoflearning.org/

Mayne, J. (2019). *A brief on contribution analysis: Principles and outcomes*. https://www.researchgate.net/publication/331159324_A_BRIEF_ON_CONTRIBUTION_ANALYSIS_PRINCIPLES_AND_CONCEPTS

McFarlane, C. (2011). The city as a machine for learning. *Transactions of the Institute of British Geographers*, 360-376. https://www.jstor.org/stable/23020800

Mezirow, J. (1978). Perspective transformation. *Adult Education, 28*, 100-110.

Mezirow, J. (1997). Transformative learning: Theory to practice. *New Directions for Adult and Continuing Education, 74*(Summer), 5-12).

Murray, T. S., Binkley, M., & Shillington, R. (2016). Reconstructing the evolution of the American supply of cognitive skills: A synthetic cohort analysis. Retrieved 05 February 2022, from American Supply-sept-14-2015.pmd (squarespace.com). Washington DC.

National Center for Educational Statistics. (n.d.). *Program for the International Assessment of Adult Competencies (PIAAC)*. https://nces.ed.gov/surveys/piaac/

National Center for Educational Statistics. (n.d.). *PIAAC – U.S. State and County Estimates Resources*. https://nces.ed.gov/surveys/piaac/state-county-estimates.asp#faqs

OECD. (2009). *PIAAC conceptual framework of the background questionnaire main survey*. https://www.oecd.org/skills/piaac/PIAAC(2011_11)MS_BQ_ConceptualFramework_1%20Dec%202011.pdf

Orhan-Karsak, H. G. & Yurtçu, M. (2021). The effects of pre-service teachers' extracurricular study habits and emotion regulation on lifelong learning tendencies in Covid-19 process. *International Journal of Curriculum and Instruction, 13*(1), 334-342.

Osborne, M., Kearns, P., & Yang, J. (2013). Learning cities: developing inclusive, prosperous and sustainable urban communities. *International Review of Education*, 59, 409-423.

Oser, J. (2017). Assessing how participators combine acts in their "political tool kits": A person-centered measurement approach for analyzing citizen participation. *Social Indicators Research, 133*, 235-258. DOI 10.1007/s11205-016-1364-8

Öteleş, Ü. U. (2020). A study on the examination of the relationship between lifelong learning tendency and digital literacy level. *European Journal of Education Studies, 7*(8), 57-73. DOI: 10.46827/ejes.v7i8.3185

Pesen, A. & Epçaçan, C. (2017). The analysis of high school students' tendencies about lifelong learning. *Universal Journal of Educational Research, 5*(12A), 26-31. DOI: 10.13189/ujer.2017.051305

Phillips, G. W. (2007). Change favors the prepared mind: Mathematics and science indicators for comparing states and nations. *American Institutes for Research*. http://www.air.org

Plumb, D., Leverman, A., & McGray, R. (2007). The learning city in a 'planet of slums'. *Studies Continuing Education*, *29*(1), 37-50. DOI : 10.1080/01580370601146296

Popović, K., Maksimović, M., Jovanović, A., & Joksimović, J. (2020). New learning sites in learning cities – public pedagogy and civic education. *Studies in Adult Education and Learning, 26*(1), 33-51. DOI: http://dx.doi.org/10.4312/as.26.1.33-51

Preisinger-Kleine, R. (2013). An analytical quality framework for learning cities and regions. *International Review of Education*, 59, 521-538. https://doi.org/10.1007/s11159-013-9364-2

Rhodes, C. M., Cordie, L., & Wooten, M. (2019). An examination of social capital among US Adults: Patterns that facilitate social well-being as measured by PIAAC. *International Journal of Learning, Teaching and Educational Research, 18*(2), 1-12. http://www.ijlter.org/

Rogers, P. (2014). Overview: Strategies for causal attribution. *Methodological Briefs Impact Evaluation*, *6*., UNICEF Office of Research.

Rose, A. D., Smith, T. J., Ross-Gordon, J. M., Zarestky, J., Lopes, T., Smith, M. C., Grotlüschen, A., and Fleige, M. (2019). Adults' civic engagement in the U.S. and Germany: Evidence from the PIAAC survey. *PIAAC Gateway*. http://piaacgateway.com/researchpapers

Rubenson, K. (2019). Assessing the status of lifelong learning: Issues with composite indexes and surveys on participation. *International Review of Education, 65*, 295-317. https://doi.org/10.1007/s11159-019-09768-3

Rüber, I. E., Rees, S., Schmidt-Hertha, B. (2018). Lifelong learning - lifelong returns? A new theoretical framework for the analysis of civic returns on adult learning. *International Review of Education*, 64, 543-562. https://doi.org/10.1007/s11159-018-9738-6

Rüber, I. E. & Janmaat, J. G. (2021). Does participation in adult education increase volunteering? An analysis of British longitudinal data. *Adult Education Quarterly, 71*(1), 55-72. DOI: 10.1177/0741713620927348

Schoon, I., & Cheng, H. (2011). Determinants of political trust: A lifetime learning model. *Developmental Psychology, 47*(3), 619-631. DOI: 10.1037/a0021817

Scott, L. (2015). Learning cities for all: Directions to a new adult education and learning movement. *New Directions for Adult and Continuing Education, 145*(spring), 83-94. DOI: 10.1002/ace

Şentürk, Ş. (2019). Investigation of pre-service teachers' techno-pedagogical skills and lifelong learning tendencies. *Participatory Educational Research, 6*(2), 78-92. http://dx.doi.org/10.17275/per.19.14.6.2

Sezen-Gultekin, G. & Gür Erdogan, D. (2016). The relationship and effect between lifelong learning tendencies and social entrepreneurship characteristics of prospective teachers. *Anthropologist, 24*(1), 113-118. DOI: 10.1080/09720073.2016.11891996

Snell, R. S., Chan, M. Y. L., Ma, C. H. K., & Chan, C. K. M.(2015). Developing civic-mindedness in undergraduate business students through service-learning project for civic engagement and service leadership practices for civic improvement. *Asian Journal of Business Ethics, 4*, 73-99. DOI 10.1007/s13520-015-0044-0

Su, Y. (2010). The learning society: Two justifications. *Australian Journal of Adult Learning, 50*(1), 10-25.

Sulkunen, S., Nissinen, K., & Malin, A. (2021). The role of informal learning in adults' literacy proficiency. *European Journal for Research on the Education and Learning of Adults, 12*(2), 207-222. http://doi.org/10.3384/rela.2000-7426.1325

Sze-Yeung Liu, C. and Chi-leung Hui, P. (2021). Service learning: impacts of learning motivation and learning experience on extended social/civic engagement. *Higher Education Research & Development*, *40*(2), 400-415. https://doi.org/10.1080/07294360.2020.1756748

Talò, C. & Mannarini, T. (2015). Measuring participation: Development and validation the participatory behaviors scale. *Social Indicators Research, 123*, 799–816. https://doi.org/10.1007/s11205-014-0761-0

Taylor, E. W. (2008). Transformative learning theory. *New Directions for Adult and Continuing Education,119*, 5-15. DOI: 10.1002/ace

Tezer, M. & Aynas, N. (2018). The effect of university education on lifelong learning tendency. *Cypriot Journal of Educational Sciences, 13*(1), 66-80.

Thomas, E. (2017). The outcomes and impacts of everyday learning. *International Journal of Lifelong Education, 36*(3), 308-323. https://doi.org/10.1080/02601370.2016.1249971

Tsatsaroni, A. & Evans, J. (2014). Adult numeracy and the totally pedagogised society: PIAAC and other international surveys in the context of global educational policy on lifelong learning. *Educational Studies in Math, 87*, 167-186. DOI 10.1007/s10649-013-9470-x

UNESCO Institute for Lifelong Learning. (2015*). UNESCO global network of learning cities guiding documents*. https://uil.unesco.org/lifelong-learning/learning-cities/unesco-global-network-learning-cities-guiding-document

UNESCO Institute for Lifelong Learning. (2016). Harnessing the potential of ICTs: Literacy and numeracy programmes using radio, TV, mobile phones, tablets and computers. *LitBase*. http://www.unesco.org/uil/litbase

UNESCO Institute for Lifelong Learning. (n.d.). *UNESCO Global Network of Learning Cities*. https://uil.unesco.org/lifelong-learning/learning-cities

U.S. Bureau of Labor Statistics. (2016). *Volunteering in the United States*. https://www.bls.gov/news.release/pdf/volun.pdf

Vanolo, A. (2018). Cities and the politics of gamification. *Cities, 74*, 320-326. https://doi.org/10.1016/j.cities.2017.12.021

Vera-Toscano, E., Rodrigues, M., & Costa, P. (2017). Beyond educational attainment: The importance of skills and lifelong learning for social outcomes. Evidence for Europe from PIAAC. *European Journal of Education, 52*, 217-231. DOI: 10.1111/ejed.12211

Watson, C. & Tiu Wu, A. (2015). Evolution and reconstruction of learning cities for sustainable actions. *New Directions for Adult and Continuing Education*, 145, Spring, 5-19. DOI: 10.1002/ace.20119

Wielkiewicz, R. M. and Meuwissen, A. S. (2014). A lifelong learning scale for research and evaluation of teaching and curricular effectiveness. *Teaching of Psychology, 41*(3), 220-227. DOI: 10.1177/0098628314537971

Wood, D. (2010). Lynch Debord: About two psychogeographies. *Cartographia, 45*(3), 185-200. DOI: 10.3138/carto.45.3.185

Yağan, S. A. (2020). Lifelong learning tendencies of vocational school students. *The Turkish Online Journal of Educational Technology, Nov*(special issue), 189-198. http://www.tojet.net/

Yilmaz, E. & Kaygin, H. (2018). The relation between lifelong learning tendency and achievement motivation. *Journal of Education and Training Studies, 6*(3a), 1-7. https://doi.org/10.11114/jets.v6i3a3141

Yorks, L. & Barto, J. (2015). Workplace, organizational, and societal: Three domains of learning for 21st-century cities. *New Directions for Adult and Continuing Education*, 145, Spring, 35-44. DOI: 10.1002/ace.20121

Yu, C. H., Lee, H. S., Lara, E., & Gan, S. (2019). Adult learning across USA, Canada, and New Zealand: A cross-cultural study of PIAAC. *International Education Studies, 12*(5), 1-16. https://doi.org/10.5539/ies.v12n5p1

Appendix

Appendix A: Auburn University Institutional Review Board

Conely Approval Expedited Protocol #21-233 EX 2105, "The Effect of Everyday Informal Learning Activities on Lifelong Learning Mindset and Civic Engagement in U.S. Adults: Towards a Learning Cities Theory of Change"

IRB Administration <irbadmin@auburn.edu>
Thu 5/13/2021 7:52 AM
To: Linnea Conely <lmc0014@auburn.edu>
Cc: Leslie Cordie <lesliecordie@auburn.edu>; James Satterfield <jws0089@auburn.edu>

2 attachments (4 MB)
Investigators Responsibilities rev 1-2011.docx; Conely 21-233 EX 2105 New.pdf;

Use IRBsubmit@auburn.edu for protocol-related submissions and IRBadmin@auburn.edu for questions and information.
The IRB only accepts forms posted at https://cws.auburn.edu/vpr/compliance/humansubjects/?Forms and submitted electronically.

Dear Linnea,

Your protocol entitled "The Effect of Everyday Informal Learning Activities on Lifelong Learning Mindset and Civic Engagement in U.S. Adults: Towards a Learning Cities Theory of Change" has been approved as "EX" under federal regulation 45 CFR 46.101(b)(4). Attached is your approved protocol.

Official notice:
This e-mail serves as official notice that your protocol has been approved. By accepting this approval, you also accept your responsibilities associated with this approval. Details of your responsibilities are attached.

Consent documents:
Since you do not have to wait to for the return of any consent documents, please conduct your study at your convenience.

Expiration:
Continuing review of this Exempt protocol is not required; however, all modification/revisions to the approved protocol must be reviewed and approved by the IRB.

When you have completed all research activities, have no plans to collect additional data and have destroyed all identifiable information as approved by the IRB, please notify this office via e-mail. A final report is no longer required for Exempt protocols.

Please Note: With future submissions include requested version date and include faculty PI in item 1.c as key personnel. NOTE Leslie Cordie, Faculty PI, has responsibility for this student led research.

Best wishes for success with your research!

IRB Admin
Office of Research Compliance
Auburn University
115 Ramsay Hall
Auburn, AL 36849


AUBURN
RESEARCH

Auburn University Human Research Protection Program

EXEMPTION REVIEW APPLICATION

For information or help completing this form, contact: **THE OFFICE OF RESEARCH COMPLIANCE**
Phone: 334-844-5966 **Email:** IRBAdmin@auburn.edu

Submit completed application and supporting material as one attachment to IRBsubmit@auburn.edu.

1. PROJECT IDENTIFICATION **Today's Date** April 17, 2021

a. Project Title The Effect of Everyday Informal Learning Activities on Lifelong Learning Mindset and Civic Engagement in U.S. Adults: Towards a Learning Cities Theory of Change

b. Principal Investigator Linnea M. Haren Conely Degree(s) B.A., M.Ed., M.R.P., M.L.A.
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Faculty Principal Investigator (required if PI is a student) Leslie A. Cordie
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Dept Head James W. Satterfield Department/School Educational Foundations, Leadership, and Technology
Phone Number 334-844-4460 AU Email jws0089@auburn.edu

c. Project Personnel – Identify all individuals who will be involved with the conduct of the research and include their role on the project. Role may include design, recruitment, consent process, data collection, data analysis, and reporting. Attach a table if needed for additional personnel.

Personnel Name Linnea M. Haren Conely Degree (s) B.A., M.Ed., M.R.P., M.L.A.
Rank/Title Doctoral Candidate Department/School Educational Foundations, Leadership, and Technology
Role Design, data collection, data analysis, and reporting
AU affiliated? ☒ YES ☐ NO If no, name of home institution _____
Plan for IRB approval for non-AU affiliated personnel? _____

Personnel Name William Murrah Degree (s) B.S., M.Ed., Ph.D.
Rank/Title Assistant Professor Department/School Educational Foundations, Leadership, and Technology
Role Design, data analysis
AU affiliated? ☒ YES ☐ NO If no, name of home institution _____
Plan for IRB approval for non-AU affiliated personnel? _____

Personnel Name _____ Degree (s) _____
Rank/Title _____ Department/School _____
Role _____
AU affiliated? ☐ YES ☐ NO If no, name of home institution _____
Plan for IRB approval for non-AU affiliated personnel? _____

d. Training – Have all Key Personnel completed CITI human subjects training (including elective modules related to this research) within the last 3 years? YES ☑ NO ☐

Allow Space for the AU IRB Stamp

e. Funding source – Is this project funded by the investigator(s)? ☐ YES ☑ NO
Is this project funded by AU? ☐ YES ☑ NO If YES, identify source _____
Is this project funded by an external sponsor? ☐ YES ■ No If YES, provide the name of the sponsor, type of sponsor (governmental, non-profit, corporate, other), and an identification number for theaward.
Name_____Type_____Grant # _____

f. List other AU IRB-approved research studies and/or IRB approvals from other institutions that are associated with this project.
None

2. Mark the category or categories below that describe the proposedresearch:

☐ 1. Research conducted in established or commonly accepted educational settings, involving normal educational practices. The research is not likely to adversely impact students' opportunity to learn or assessment of educators providing instruction. 104(d)(1)

☐ 2. Research only includes interactions involving educational tests, surveys, interviews, public observation if at least ONE of the following criteria. (The research includes data collection only; may include visual or auditory recording; may NOT include intervention and only includes interactions). **Mark the applicable sub-category below (i, ii, or iii).** 104(d)(2)

☐ (i) Recorded information cannot readily identify the participant (directlyorindirectly/linked); **OR**
- surveys and interviews: no children;
- educational tests or observation of public behavior: can only include childrenwhen investigators do not participate in activities being observed.

☐ (ii) Any disclosures of responses outside would not reasonably place participant at risk; **OR**

☐ (iii) Information is recorded with identifiers or code linked to identifiers and IRB conducts limited review; no children. **Requires limited review by the IRB.***

☐ 3. Research involving Benign Behavioral Interventions (BBI)** through verbal, written responses (including data entry or audiovisual recording) from adult subjects who prospectively agree and ONE of the following criteria is met. (This research does not include children and does not include medical interventions. Research cannot have deception unless the participant prospectively agrees that they will be unaware of or misled regarding the nature and purpose of the research)
Mark the applicable sub-category below (A, B, or C). 104(d)(3)(i)

☐ **(A)** Recorded information cannot readily identify the subject (directly or indirectly/linked); **OR**

☐ **(B)** Any disclosure of responses outside of the research would not reasonably placesubject at risk; **OR**

☐ **(C)** Information is recorded with identifiers and cannot have deception unless participant prospectively agrees. **Requires limited review by the IRB.***

■ 4. Secondary research for which consent is not required: use of identifiable information or identifiable bio-specimen that have been or will be collected for some other 'primary' or 'initial' activity, if one of the following criteria is met. Allows retrospective and prospective secondary use. **Mark the applicable sub-category below (I, ii, iii, or iv).** 104(d)(4)

■ (i) Biospecimens or information are publically available;

☐ (ii) Information recorded so subject cannot readily be identified, directlyorindirectly/linked; investigator does not contact subjects and will not re-identify thesubjects;OR

☐ (iii) Collection and analysis involving investigators use of identifiable health information when use is regulated by HIPAA "health care operations" or "research or "public health activities and purposes" (does not include biospecimens (only PHI and requires federal guidance on how to apply); OR

☐ (iv) Research information collected by or on behalf of federal government usinggovernment generated or collected information obtained for non-researchactivities.

☐ 5. Research and demonstration projects which are supported by a federal agency/department AND designed to study and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs;(iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs. (must be posted on a federal web site). 104(d)(5) (must be posted on a federal web site)

☐ 6. Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture. The research does not involve prisoners as participants. 104(d)(6)

New exemption categories 7 and 8: Both categories 7 and 8 require Broad Consent. (Broad consent is a new type of informed consent provided under the Revised Common Rule pertaining to storage, maintenance, and secondary research with identifiable private information or identifiable biospecimens. Secondary research refers to research use of materials that are collected for either research studies distinct from the current secondary research proposal, or for materials that are collected for non-research purposes, such as materials that are left over from routine clinical diagnosis or treatments. Broad consent does not apply to research that collects information or biospecimens from individuals through direct interaction or intervention specifically for the purpose of the research.) **The Auburn University IRB has determined that as currently interpreted, Broad Consent is not feasible at Auburn and these 2 categories WILL NOT BE IMPLEMENTED at this time.**

****Limited IRB review* – the IRB Chairs or designated IRB reviewer reviews the protocol to ensure adequate provisions are in place to protect privacy and confidentiality.**

*****Category 3 – Benign Behavioral Interventions (BBI)* must be brief in duration, painless/harmless, not physically invasive, not likely to have a significant adverse lasting impact on participants, and it is unlikely participants will find the interventions offensive or embarrassing.**

3. PROJECT SUMMARY

a. Does the study target any special populations? (Mark applicable)

Minors (under 18 years of age)	☐ YES ☑ NO
Pregnant women, fetuses, or any products of conception	☐ YES ☑ NO
Prisoners or wards (unless incidental, not allowed for Exempt research)	☐ YES ☑ NO
Temporarily or permanently impaired	☐ YES ☑ NO

b. Does the research pose more than minimal risk to participants? ☐ YES ☑ NO

Minimal risk means that the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or test. 42 CFR 46.102(i)

c. Does the study involve any of the following?

Procedures subject to FDA regulations (drugs, devices, etc.)	☐ YES ☑ NO
Use of school records of identifiable students or information from instructors about specific students.	☐ YES ☑ NO
Protected health or medical information when there is a direct or Indirect link which could identify the participant.	☐ YES ☑ NO
Collection of sensitive aspects of the participant's own behavior, such as illegal conduct, drug use, sexual behavior or alcohol use.	☐ YES ☑ NO
Deception of participants	☐ YES ☑ NO

4. Briefly describe the proposed research, including purpose, participant population, recruitment process, consent process, research procedures and methodology.

This project uses secondary research. The purpose of this study is to construct a series of structural models that can be used with a public use data file to test how everyday informal learning activities, such as reading a newspaper or using the Internet to find more information about issues, may influence one's lifelong learning mindset, as well as how this mindset affects three types of civic engagement: one's sense of political efficacy, social trust, and frequency of volunteerism. The intention of this study is to add to the theoretical understanding of how learning cities' promotion of lifelong learning can lead to social change. Data used in this study come from the background survey of the Program for the International Assessment of Adult Competencies (PIAAC) that is administered through the National Center for Education Statistics in the U.S. The PIAAC is designed to evaluate and compare the basic skills and competencies of adults worldwide. The background survey is conducted as a face-to-face interview and was given in English and Spanish. This study uses the U.S. 2017 public use data file for the PIAAC that is available on the NCES website (https://nces.ed.gov/surveys/piaac/datafiles.asp). Answers to questions on the survey will be used as potential indicators for three latent variables (informal learning activities, lifelong learning mindset, and civic engagement) and tested for fit through

5. Waivers

Check any waivers that apply and describe how the project meets the criteria for the waiver. Provide the rationale for the waiver request.

- ☒ **Waiver of Consent (Including existing de-identified data)**
- ☒ **Waiver of Documentation of Consent (Use of Information Letter)**
- ☒ **Waiver of Parental Permission**

All retrospective information will be de-identified.

This project uses secondary research. NCES conducted the primary research and was responsible for recruiting participants and gaining their consent. To further protect respondents, some information is not available in the public use data file which this study is using. Some participants were between the ages of 16 and 19, and NCES was responsible for acquiring the parental permission. No identifying information is included in the public use data file that this project is using. For more information see https://nces.ed.gov/surveys/piaac/household.asp.

6. **Describe how participants/data/specimens will be selected. If applicable, include gender, race, and ethnicity of the participant population.**

This study is using secondary research. NCES, who conducted the primary research, explains their participant selection as follows: "The U.S. sample design employed by PIAAC in the U.S. data collections is generally referred to as a four-stage stratified area probability sample. This method involves the selection of (1) primary sampling units (PSUs) consisting of counties or groups of contiguous counties, (2) secondary sampling units (referred to as segments) consisting of area blocks, (3) dwelling units (DUs) selected from address listings, and (4) eligible persons (the ultimate sampling unit) within DUs. Random selection methods are used at each stage of sampling" (https://nces.ed.gov/surveys/piaac/faq.asp#6). Participation is voluntary.

7. **Does the research involve deception? ☐ YES ☒ NO If YES, please provide the rationale for deception and describe the debriefing process.**

8. **Describe why none of the research procedures would cause a participant either physical or psychological discomfort or be perceived as discomfort above and beyond what the person would experience in daily life.**

N/A. This study uses a public use data file.

9. **Describe the provisions to maintain confidentiality of data, including collection, transmission, and storage.**

N/A. This study uses a public use data file.

10. **Describe the provisions included in the research to project the privacy interests of participants (e.g., others will not overhear conversations with potential participants, individuals will not be publicly identified or embarrassed).**

N/A. This study uses a public use data file that does not include any identifying information.

11. **Will the research involve interacting (communication or direct involvement) with participants?**
☐ **YES** ☒ **NO If YES, describe the consent process and information to be presented to subjects. This includes identifying that the activities involve research; that participation is voluntary; describing the procedures to be performed; and the PI name and contact information.**

12. Additional Information and/or attachments.

In the space below, provide any additional information you believe may help the IRB review of the proposed research. If attachments are included, list the attachments below. Attachments may include recruitment materials, consent documents, site permissions, IRB approvals from other institutions, etc.

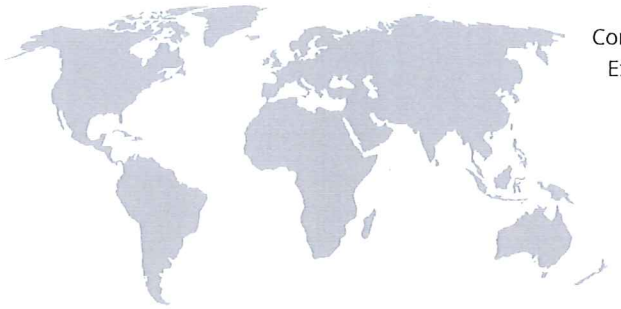
No attachments or additional information.

Principal Investigator's Signature Linnea Conely Digitally signed by Linnea Conely Date: 2021.04.27 22:13:47 -05'00' **Date** 04-27-2021

If PI is a student,
Faculty Principal Investigator's Signature Leslie Cordie Digitally signed by Leslie Cordie Date: 2021.04.30 10:47:51 -04'00' **Date** 04-30-2021

Department Head's Signature James Satterfield **Date** 4/30/21

CITI PROGRAM



Completion Date 06-Mar-2019
Expiration Date 05-Mar-2022
Record ID 30793071

This is to certify that:

Linnea Conely

Has completed the following CITI Program course:

Not valid for renewal of certification through CME. Do not use for TransCelerate mutual recognition (see Completion Report).

IRB # 2 Social and Behavioral Emphasis - AU Personnel - Basic/Refresher (Curriculum Group)

IRB # 2 Social and Behavioral Emphasis - AU Personnel (Course Learner Group)

1 - Basic Course (Stage)

Under requirements set by:

Auburn University

CITI
Collaborative Institutional Training Initiative

Verify at www.citiprogram.org/verify/?w20c2792d-2985-4a0a-993c-8465b73299a0-30793071

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Leslie Cordie (ID: 2905745)
- **Institution Affiliation:** Auburn University (ID: 964)
- **Institution Email:** lesliecordie@auburn.edu
- **Institution Unit:** EFLT
- **Phone:** 334-844-3089

- **Curriculum Group:** IRB Additional Modules
- **Course Learner Group:** Social, Behavioral and Education Sciences
- **Stage:** Stage 1 - Basic Course
- **Description:** Choose this group to satisfy CITI training requirements for Investigators and staff involved primarily in biomedical research with human subjects.

- **Record ID:** 38525693
- **Completion Date:** 07-Jan-2021
- **Expiration Date:** 07-Jan-2024
- **Minimum Passing:** 80
- **Reported Score*:** 100

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Belmont Report and Its Principles (ID: 1127)	07-Jan-2021	3/3 (100%)
Students in Research (ID: 1321)	07-Jan-2021	5/5 (100%)
History and Ethical Principles - SBE (ID: 490)	07-Jan-2021	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	07-Jan-2021	5/5 (100%)
Assessing Risk - SBE (ID: 503)	07-Jan-2021	5/5 (100%)
Informed Consent - SBE (ID: 504)	07-Jan-2021	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	07-Jan-2021	5/5 (100%)
Research with Children - SBE (ID: 507)	07-Jan-2021	5/5 (100%)
Internet-Based Research - SBE (ID: 510)	07-Jan-2021	5/5 (100%)
Auburn University (ID: 12239)	07-Jan-2021	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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Collaborative Institutional Training Initiative (CITI Program)
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Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Leslie Cordie (ID: 2905745)
- **Institution Affiliation:** Auburn University (ID: 964)
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- **Stage:** Stage 1 - Basic Course
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- **Record ID:** 38525693
- **Report Date:** 07-Jan-2021
- **Current Score**:** 100

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Students in Research (ID: 1321)	07-Jan-2021	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	07-Jan-2021	5/5 (100%)
Belmont Report and Its Principles (ID: 1127)	07-Jan-2021	3/3 (100%)
Assessing Risk - SBE (ID: 503)	07-Jan-2021	5/5 (100%)
Informed Consent - SBE (ID: 504)	07-Jan-2021	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	07-Jan-2021	5/5 (100%)
Research with Children - SBE (ID: 507)	07-Jan-2021	5/5 (100%)
Internet-Based Research - SBE (ID: 510)	07-Jan-2021	5/5 (100%)
History and Ethical Principles - SBE (ID: 490)	07-Jan-2021	5/5 (100%)
Auburn University (ID: 12239)	07-Jan-2021	No Quiz

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COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** William Murrah (ID: 1048858)
- **Institution Affiliation:** Auburn University (ID: 964)
- **Institution Email:** wmm0017@auburn.edu
- **Institution Unit:** EFLT
- **Phone:** 3348443806

- **Curriculum Group:** CITI Conflicts of Interest
- **Course Learner Group:** Conflicts of Interest
- **Stage:** Stage 1 - Stage 1

- **Record ID:** 37103032
- **Completion Date:** 24-Jun-2020
- **Expiration Date:** 23-Jun-2024
- **Minimum Passing:** 80
- **Reported Score*:** 87

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
Financial Conflicts of Interest: Overview, Investigator Responsibilities, and COI Rules (COI-Basic) (ID: 15070)	24-Jun-2020	4/5 (80%)
Institutional Responsibilities as They Affect Investigators (COI-Basic) (ID: 15072)	24-Jun-2020	4/5 (80%)
Conflicts of Commitment and Conscience (COI-Basic) (ID: 15073)	24-Jun-2020	5/5 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k4ec92a3c-73d5-4fe4-91cf-4333b8b1190a-37103032

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COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** William Murrah (ID: 1048858)
- **Institution Affiliation:** Auburn University (ID: 964)
- **Institution Email:** wmm0017@auburn.edu
- **Institution Unit:** EFLT
- **Phone:** 3348443806

- **Curriculum Group:** CITI Conflicts of Interest
- **Course Learner Group:** Conflicts of Interest
- **Stage:** Stage 1 - Stage 1

- **Record ID:** 37103032
- **Report Date:** 24-Jun-2020
- **Current Score**:** 87

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Financial Conflicts of Interest: Overview, Investigator Responsibilities, and COI Rules (COI-Basic) (ID: 15070)	24-Jun-2020	4/5 (80%)
Institutional Responsibilities as They Affect Investigators (COI-Basic) (ID: 15072)	24-Jun-2020	4/5 (80%)
Conflicts of Commitment and Conscience (COI-Basic) (ID: 15073)	24-Jun-2020	5/5 (100%)

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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