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Motivational Determinants and Achievements on Digital Learning Tool Proficiency among University Adult Learners

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Abstract. With the rising demand for higher education among adult learners, digital learning tool proficiency has become essential for academic achievement in modern education. However, for middle-aged and older adult learners who first encountered the internet in adulthood, the use of digital tools may present substantial barriers to academic adaptation and persistence, including digital skills gaps, technology anxiety, limited prior exposure to online learning environments, and difficulty in navigating platform interfaces. This study explored the educational determinant factors influencing adult learners' digital learning tool proficiency, aiming to support the development of tailored educational strategies. Based on a survey of 441 adult learners stratified by age and representing diverse academic disciplines at a Korean university, the findings reveal notable generational differences, with younger adults demonstrating significantly higher levels of digital learning tool proficiency. Differences were also observed according to learning motivation, particularly among learners who prioritize social networking. Furthermore, digital proficiency was found to have a significant positive impact on learning beliefs and learning goal pursuit. These findings underscore the need for universities to actively support self-directed learning activities such as mentoring and collaborative learning initiatives that incorporate digital tools, thereby enhancing the academic success and persistence of adult learners.

Keywords: digital learning tool proficiency; learning motivation; learning belief; learning goal pursuit; university adult learners

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1. Introduction

Since the early 2000s, universities in the United States and other countries have increasingly responded to the rising demand for higher education among adult learners returning to academia after various social and professional experiences. According to recent OECD and Korean Ministry of Education data, the proportion of adult learners aged 30 and above in higher education has steadily increased over the past decade, reflecting a demographic shift toward lifelong learning and mid-career reskilling in response to technological change (OECD, 2024; Ministry of Education, 2023). Moreover, as the digitalization of society has accelerated and the occupational landscape has diversified, the need for upskilling and reskilling among adult learners has grown more urgent.

In response to these trends, and amidst a declining school-age population, The Korean government began actively promoting adult higher education through the 2006 revision of the Lifelong Education Act, which institutionalized support for adult learners in higher education. By 2024, approximately 10% of Korean universities operate lifelong learning colleges tailored for adult learners, in alignment with national initiatives such as the "Second Lifelong Learning Promotion Basic Plan (2023–2027)", which emphasize digital competency and flexible learning pathways. As a result, the proportion of adult learners in higher education has increased by 22.8% since 2013 (Ministry of Education, 2023).

However, generational differences in digital proficiency—from learners in their 20s to those in their 60s—create challenges for equitable participation in higher education. Although universities have rapidly adopted digital instructional methods, older learners often struggle to adapt to environments that rely on smartphones, kiosks, or online platforms (Merriam & Baumgartner, 2020). This generational digital divide between so-called 'digital natives' and 'digital immigrants' (Prensky, 2010) reflects Bourdieu's (1986) theory of educational inequality, in which learners with different starting points face unequal competition. Minimizing the digital gap and supporting digital skill acquisition among adult learners is crucial for advancing socioeconomic inclusion.

Adult learners also display more diverse educational motivations than traditional-age students (Korhonen & Portaankorva-Koivisto, 2021), and their digital proficiency often reflects previous occupational or life experiences. According to Mezirow's (2000) transformative learning theory, adult learners engage in education through meaning-making processes shaped by their prior life experiences. Some prioritize building social connections, while others return after extended periods in the workforce. These diverse backgrounds necessitate personalized instructional approaches that support reflective learning and transformational shifts, rather than one-size-fits-all models.

Helsper and Eynon (2021) argued that institutions' responsiveness to adult learners' expanding social and career-related motivations is key to successful recruitment and retention. If digital skills are as diverse as learner motivations, institutions must offer individualized support for improving those competencies.

In the digital learning environment, proficiency in using online information and applying digital content to tasks and presentations is vital to academic success.

These skills represent not just technical abilities but also proactive learning behaviors. It is therefore important to investigate which attitudinal variables contribute to greater academic performance in such environments. Digital literacy is now defined based on Vuorikari et al. (2022) and OECD (2024) as a broader competence encompassing the ability to access, evaluate, communicate, and create digital content, as well as to engage responsibly in digital environments. While Digital proficiency is defined as the actual demonstrated skill or performance level in using digital learning tools for academic purposes—aligned with the operational variables measured in our study (e.g., frequency, confidence, and functionality use).

This study focuses on two key constructs: learning belief and learning goal pursuit. Belief in one's ability to learn and actively engage in education is strongly associated with the use of digital learning tools (Goopio & Cheung, 2021). While many studies have documented the positive relationship between digital learning and achievement among younger students (Choi & Bae, 2023), similar research on adult learners remains limited.

In addition, goal-directed learners who regularly use digital tools are more likely to succeed in digital learning environments (Madsen et al., 2015). Recent studies further support this by showing that learners with strong digital engagement and motivation demonstrate higher levels of academic performance, adaptability, and lifelong learning competencies (Brata et al., 2022; Helsper & Eynon, 2021). Positive attitudes toward digital tools and proactive goal pursuit not only facilitate academic adjustment and achievement but also enhance integrated digital competencies and long-term career readiness (OECD, 2023).

Therefore, this study investigates the determinants of digital tool proficiency among adult learners and the influence of digital skills on learning beliefs and goal pursuit as shown in Figure 1. Moreover, it is guided by two research hypotheses.

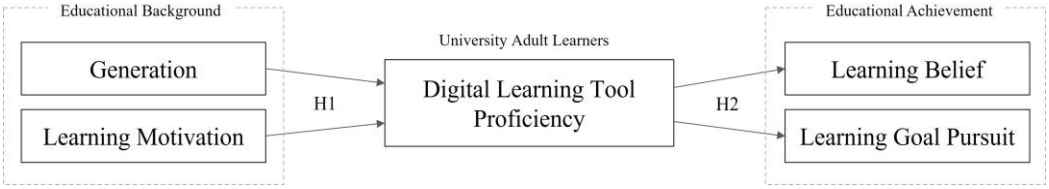

Figure 1: Research Model

- Hypothesis 1: Digital learning tool proficiency among university adult learners varies according to generational cohort and learning motivation.
- Hypothesis 2: Digital learning tool proficiency positively affects learning belief and learning goal pursuit.

By addressing these two hypotheses, this study aims to contribute to a more nuanced understanding of how digital skills interact with both generational characteristics and motivational factors among adult learners in higher education. The findings are expected to inform the development of tailored instructional strategies that support digital inclusion and lifelong learning, ultimately enhancing adult learners' academic engagement, persistence, and success in a rapidly evolving educational landscape.

2. Literature Review

2.1 Digital Proficiency among University Adult Learners

The ability to utilize digital learning tools has become indispensable in higher education. Students not only engage with university-provided platforms but also employ external digital tools for a range of academic purposes, including AI-powered platforms such as ChatGPT for project-based tasks and evolving tools for collaboration and presentations (Berková et al., 2024). Reflecting these changes, digital literacy is now widely recognized by university students as a prerequisite for academic engagement and lifelong learning (OECD, 2023). Recent research shows that students with greater confidence in digital learning tools demonstrate higher metacognitive awareness and are more likely to adopt strategic learning approaches.

While younger learners tend to adapt more readily to these transitions, older adult learners often perceive digital tools as burdensome due to limited exposure and prior learning experiences. Early explanations of this divide—such as Prensky's (2010) "digital natives" versus "digital immigrants" dichotomy—have since been challenged by more nuanced models like White and Le Cornu's (2011) 'visitor-resident' continuum, which emphasize behavioral engagement over age-based assumptions. Similarly, while Carr (2000) attributed difficulties among older learners to age-related declines in fluid intelligence, more recent scholarship suggests that crystallized intelligence and accumulated knowledge may offset such challenges, allowing older learners to adapt when supported with appropriate scaffolding.

In Korea, a report by the Ministry of Science and ICT (2023) showed that individuals in their 20s scored a digital literacy index of 123.7%, while those in their 50s and 60s scored below average, with the 60s age group scoring only 78.6%. Despite this gap, empirical studies that examine the digital divide between digital natives and immigrants remain limited. This highlights the need for foundational research to foster inclusive, generationally responsive education systems.

Furthermore, while digital competence plays a critical role in online learning success, it is not the sole factor influencing dropout risk. Studies indicate that adult learners face a constellation of challenges, including time management difficulties, financial burdens, and competing professional or familial obligations (Kersh & Huegler, 2019). Kim and Choi (2020) found that 36.9% of adult learners in Korean cyber universities considered dropping out, with many citing a preference for face-to-face instruction as well as stress associated with balancing work and study. These findings highlight the need for instructional designs that

are not only digitally accessible but also socioeconomically and temporally responsive to adult learners' realities.

These findings suggest that addressing the digital learning experience gap is not merely a matter of technical skills, but of educational equity. Adult learners pursuing higher education for career advancement may find themselves at a disadvantage if their digital literacy is low, thus reinforcing barriers to socioeconomic mobility (Helsper & Eynon, 2021).

2.2 Learning Motivation among Adult Learners

The literature on adult learning motivation has evolved from foundational frameworks proposed by Houle (1961), Morstain and Smart (1976), and Sheffield (1985), who categorized adult motivations into goal-oriented (career advancement, credentialing), activity-oriented (social interaction, leisure), and learning-oriented (intrinsic intellectual curiosity). While this tripartite classification continues to be referenced in adult education research, it has since been extended by contemporary models such as Boshier's (2006) Educational Participation Scale (EPS), which introduces nuanced motivational subtypes including social stimulation, professional advancement, and cognitive interest.

Additionally, advancements in Self-Determination Theory (Deci & Ryan, 2000) provide a more granular understanding of intrinsic and extrinsic motivations, emphasizing autonomy, competence, and relatedness as psychological needs driving adult learners' engagement. These modern perspectives complement classical classifications and offer a multidimensional view of motivational dynamics in adult learning contexts.

Adult learners' motivations are influenced by a complex interplay of demographic and contextual factors such as age, profession, economic status, and cultural roles (Cincinnato et al., 2024). For example, younger adults may be driven by credentialing and labor market entry, while middle-aged learners often seek career change or upskilling, and older adults may pursue learning for social engagement or intellectual enrichment (Yoo & Huang, 2013). These motivational patterns are not static; they interact with life stages and professional trajectories, leading to dynamic shifts over time (Korhonen & Portaankorva-Koivisto, 2021).

Recent large-scale surveys in Korea (Lee et al., 2025) confirm this heterogeneity, showing that motivation types vary significantly across age cohorts and occupational sectors. This empirical evidence supports the notion that motivation profiles among adult learners have become increasingly differentiated in response to changing workforce demands and educational opportunities.

Among these, what Houle (1961) originally classified *as goal-oriented motivation* – pursuing education for practical purposes such as career advancement or meeting external expectations—remains especially prominent among adult learners. Based on Houle's theory, Sarka and Ilona (2014) emphasized that institutional responsiveness to such practical, goal-driven needs is central to attracting and supporting adult learners in contemporary higher education environments.

Moreover, despite potential challenges with time, cost, and technology, adult learners' strong internal motivation can help mitigate these barriers (Cincinnato et al., 2016). Career-related motivations have become more prevalent as adults seek retraining opportunities in an increasingly digital job market (Ditlhale & Geesje, 2024). Importantly, this study also considers activity-oriented motivations—particularly the human desire for connection, community, and learning as a social process—which distinguish adult learners from younger students (Roksolana et al., 2020). Additionally, adult learners often pursue academic engagement out of intellectual curiosity (Kim et al., 2024).

Such diverse motivations not only influence learners' participation but also impact the intensity and sustainability of their engagement (Gopalan et al., 2019). In fact, learning motivation can determine learners' use of digital tools and pursuit of academic goals. Goopio and Cheung (2021) found that different types of learning motivation significantly shape learner achievment, highlighting the importance of addressing this diversity in adult education programs.

2.3 Learning Attitudes as Determinant Factors

A sustained learning attitude is critical in the era of digital transformation. From the lifelong learning perspective, adult learners increasingly recognize the value of continuous learning and take initiative in addressing their educational needs (Dillard et al., 2024). This proactive stance is conceptualized as *learning belief*—referring to the perceived value of acquiring new knowledge and maintaining active engagement with learning tasks (Collins et al., 2009). The construct is rooted in the broader tradition of epistemological beliefs, first introduced by Perry (1968) and further expanded by Schommer (1994), who argued for a multidimensional approach to understanding how individuals perceive knowledge and learning.

Building upon these foundations, Muis (2007) proposed an integrated theoretical framework that links epistemological beliefs with motivation, self-regulation, and learning outcomes—highlighting learning belief as a motivational-affective component influencing academic engagement. Moreover, research has shown that learning beliefs may differ significantly across age groups. For instance, Seaman et al. (2015) found that learners over 50 tend to adopt more pragmatic and utilitarian learning goals, compared to the exploratory and performance-oriented goals more common among younger adults. These generational patterns warrant greater attention in the design of inclusive learning environments.

Such attitudes have been shown to be just as important as technical skills in determining academic success. Hofer (2001) conceptualized beliefs about ability as part of epistemological belief structures, particularly the dimension of innate ability versus incremental learning. Madsen et al. (2015) operationalized this construct using a Likert-scale survey measuring learners' confidence in their capacity to acquire new skills through effort. Their findings demonstrated that learners who believed ability is malleable (rather than fixed) showed higher persistence and academic performance—especially among adult learners pursuing education for career advancement.

In online settings, such as MOOCs, Goopio and Cheung (2021) found that learning persistence and positive perceptions significantly predicted academic success. Repeated positive experiences in digital learning environments help reinforce learning belief over time. In a study of Korean digital natives, Choi and Bae (2023) reported that 87% of students in an experimental group expressed greater interest in learning after digital device-based instruction. However, this attitudinal response should be interpreted alongside measurable learning outcomes, as the study did not assess whether increased interest translated into improved academic performance or skill acquisition.

Moreover, adult learners who proactively set academic goals and strive to achieve them demonstrate stronger adaptation to university life. This attitude, referred to as learning goal pursuit, underscores the importance of motivation and personal agency in academic readiness (Dillard et al., 2024; Peterson et al., 2003). Unlike the structured environments of K–12 education, higher education requires learners to take ownership of their academic pathways, making learning goal pursuit a decisive factor in success.

From Cross (1981) to Bellare et al. (2022), previous studies have observed that learning motivation helps fulfill goal pursuit, suggesting that adult learners' use of digital tools is linked not only to skill level but also to attitude. Adult learners integrate experiential knowledge from various domains—such as family, workplace, and community life—into academic contexts (Cincinnato et al., 2016; Kim et al., 2024). These life experiences help develop crystallized intelligence, which supports analytical reasoning and academic performance (Brata et al., 2022). Therefore, adult learners must learn to distinguish between familiar digital skills and those requiring deliberate practice and goal setting. Universities, in turn, should provide structured and personalized support to help these learners build digital confidence and learning belief.

In summary, the existing literature underscores the multifaceted nature of adult learners' experiences in higher education, shaped by generational digital divides, diverse learning motivations, and evolving learning attitudes. While digital proficiency is increasingly foundational to academic engagement, it is deeply interwoven with learners' motivational orientations and belief systems. These factors jointly influence how adult learners navigate academic tasks, persist in goal setting, and adapt to digital learning environments. Given the complexity of these interrelations (Lanford, 2021), this study seeks to offer an integrative perspective that connects digital skill levels with personal and attitudinal variables.

3. Methodology

3.1 Research Design

This study employed a quantitative, cross-sectional research design to examine the digital learning tool proficiency of university adult learners and to explore the educational background and attitudinal factors associated with this proficiency. Grounded in established adult learning and motivation theories, the research aimed to capture the diversity of learner characteristics and assess how these

factors relate to perceived digital learning competencies within a digitalized higher education environment. Data were collected using a structured questionnaire administered to adult learners enrolled in a Korean university offering government-accredited adult degree programs. The variables measured included digital proficiency, learning motivation, learning belief, and learning goal pursuit.

While the design allowed for comparative analysis across generational cohorts and motivational categories, we acknowledge that the cross-sectional nature of the study limits the ability to infer causality. Furthermore, although the survey captured participants' demographic and educational characteristics, it did not explicitly control for potential confounding variables such as prior exposure to digital tools, which may have influenced self-assessed digital proficiency. Future research using longitudinal or experimental designs is recommended to address these limitations more rigorously.

3.2. Participants

This study was conducted at a Korean university operating a government-accredited college specifically designed for adult learners. As of 2024, the institution had 924 adult learners enrolled in degree programs. To ensure diversity across age, gender, and occupational status, a purposive stratified sampling method was employed. The sampling criteria included age cohort representation (20s–60s), balanced gender distribution, and varying employment statuses, aligning with the university's support systems for adult learners in career-transition or upskilling pathways.

A total of 441 adult learners participated in the survey (response rate = 47.7%), with a nearly equal gender split (49.2% male, 50.8% female). The age distribution spanned five decades, with the largest group in their 30s (42.9%). Approximately 53.7% were currently employed, and among the 46.3% unemployed participants, 35.1% expressed a strong intention to join the workforce—resulting in an overall employment-oriented tendency of 88.8%.

Table 1. Demographic Characteristics of Participants (N = 441)

Demographic Profile		N	%
Gender	Male	217	49.2
	Female	224	50.8
Generation	20s	123	27.9
	30s	189	42.9
	40s	60	13.6
	50s	56	12.7
	60s	13	2.9
Employment Status	Employed	237	53.7
	Unemployed	204	46.3
Future Employment Intention	Yes	155	35.1
	No	49	11.1
Learning Motivation	Career and Job Development	218	49.4
	Academic Credential Acquisition	114	25.9
	Social Networking	57	12.9
	Personal Enjoyment	34	7.7

	Passion for Learning	18	4.1
Digital Tool Proficiency	High (Above Mean)	210	47.6
	Medium (Mean, 4.04)	100	22.7
	Low (Below Mean)	131	29.7

3.3 Data Collection

This study was conducted in the second semester of 2024 using a structured questionnaire to examine adult learners' digital learning tool proficiency, learning motivation, learning belief, and learning goal pursuit. The digital learning tool proficiency scale consisted of two items measuring awareness of digital platforms for information gathering and the ability to apply digital tools to academic tasks. Cronbach's alpha for this scale was 0.614, which met the moderate acceptance criteria.

Learning motivation was reconstructed using theoretical foundations from Morstain and Smart (1976), Sheffield (1985) and Boshier (2006), yielding five categories: career and job development, academic credential acquisition, social networking, personal enjoyment, and intrinsic learning passion. Learning belief was assessed with three items adapted from Hong et al. (2003) and Job et al. (2010), capturing beliefs about the value of university education, active participation, and openness to new knowledge ($\alpha = 0.730$).

Learning goal pursuit was measured with two items based on Lee (2007) and Peterson et al. (2003), assessing goal-setting initiative and persistence. However, this scale showed relatively low internal consistency ($\alpha = 0.566$), In this study, following the argument by Ekolu and Quainoo (2009), we adopted the view that for scales with as few as two items, a Cronbach's alpha of 0.5 or higher is considered acceptable.

3.4 Data Analysis

A total of 441 valid responses were analyzed using SPSS program. To test Hypothesis 1, which explored generational and motivational differences in digital learning tool proficiency, one-way analysis of variance (ANOVA) was employed to identify statistically significant differences in group means at the 5% significance level. Additionally, Duncan's post-hoc analysis was conducted to identify specific group differences while accounting for potential sample size imbalances. This approach allowed for more nuanced interpretation of the variations among subgroups within both generation and motivation categories. Hypothesis 2, which examined the influence of digital learning tool proficiency on learning belief and learning goal pursuit, was tested using multivariate analysis of variance (MANOVA).

Prior to conducting the main statistical analyses, several assumptions were tested to ensure the validity of the results. First, the assumption of normality was assessed using skewness and kurtosis values for the main variables. All values fell within the acceptable range of ±3, indicating approximate normal distributions. Second, the homogeneity of variances was examined using Levene's test prior to ANOVA analyses. The results confirmed that the variance across groups was sufficiently equal ($p > .05$), supporting the use of parametric tests. Third,

multicollinearity was tested through variance inflation factor (VIF) values in the regression models. All VIF values were below the threshold of 5.0, indicating no serious multicollinearity concerns. These assumption checks affirm the robustness of the statistical procedures employed in this study.

4. Results

4.1 Descriptive Analysis

In this study, the variables of digital learning tool proficiency, learning belief, and learning goal pursuit were measured using a 5-point Likert scale. The mean values of these variables ranged from 3.87 to 4.07, and the values of skewness and kurtosis confirmed that all variables were normally distributed.

A closer examination of the item-level means revealed some noteworthy differences. Among the items measuring learning belief, the item related to the effort to learn new things showed a relatively lower mean score (3.87) compared to items reflecting positive perception of university education (4.02) and active participation in learning activities (4.00). Similarly, within learning goal pursuit, the item regarding the learner's continuous effort to achieve academic goals had a higher mean (4.07) than the item concerning the learner's initiative in setting academic goals (3.98), suggesting a slightly lower confidence or readiness in goal setting compared to goal pursuit.

Table 2. Descriptive Statistics for Main Variables

Variable	Item	Mean	SD	Skewness	Kurtosis
Digital Learning Tool Proficiency	Awareness of various online platforms for collecting information	4.00	0.83	-0.732	0.678
	Ability to apply digital content needed for university learning	4.07	0.84	-0.706	0.354
Learning Belief	Positive perception of university learning activities	4.02	0.80	-0.251	-0.701
	Active participation in university learning	4.00	0.86	-0.298	-0.865
	Effort to learn new things	3.87	0.96	-0.536	-0.557
Learning Goal Pursuit	Setting learning goals for a successful college life	3.98	0.80	-0.176	-0.795
	Continuous effort to achieve learning goals	4.07	0.72	-0.440	0.211

4.2 Differences in Digital Learning Tool Proficiency by Generation and Learning Motivation

Consistent with previous research, the results of this study revealed that younger adult learners exhibited significantly higher levels of digital learning tool proficiency compared to their older counterparts. The Duncan post-hoc test further confirmed that the differences in digital proficiency among young, middle-aged, and older adult learners were statistically significant ($F = 29.824$, $p < 0.001$). Based on these findings, Hypothesis 1 was supported.

In addition, significant differences were found in digital learning tool proficiency across the five types of learning motivation ($F = 4.803$, $p < 0.001$). Specifically, adult learners who enrolled in university driven by a pure passion for learning demonstrated the lowest levels of digital proficiency ($M = 3.53$). The post-hoc analysis revealed that adult learners who pursued education for purposes such as social networking ($M = 4.17$), personal enjoyment ($M = 4.13$), career and job development ($M = 4.10$), and academic credential acquisition ($M = 3.89$) had significantly higher digital learning tool proficiency than those motivated purely by the intrinsic joy of learning.

Notably, learners motivated by social networking exhibited the highest proficiency among all groups, suggesting that their active engagement with digital tools to build interpersonal relationships in online environments may have contributed to their greater skill levels. These findings emphasize that motivation type is an important factor influencing digital tool proficiency among adult learners, further supporting the need for tailored educational strategies that account for motivational diversity.

Table 3. Differences in Digital Tool Proficiency

Category	N	M	SD	F	p	Post-Hoc
Total	**441**	**4.03**	**0.71**	**-**	**-**	**-**
Generation						
20s	123	4.30	0.56	29.824	0.000	20, 30 > 40, 50 > 60
30s	189	4.16	0.54			
40s	60	3.76	0.73			
50s	56	3.58	0.72			
60s	13	2.81	1.36			
Learning Motivation						
Career and Job Development (a)	218	4.10	0.64	4.803	0.001	e, c, a, b > d
Academic Credential Acquisition (b)	114	3.89	0.69			
Personal Enjoyment (c)	34	4.13	0.86			
Passion for Learning (d)	18	3.53	1.04			
Social Networking (e)	57	4.17	0.69			

4.3 The Effects of Digital Learning Tool Proficiency on Learning Belief and Learning Goal Pursuit

In relation to Hypothesis 2, a multivariate analysis was conducted to examine the effects of digital learning tool proficiency on learning belief and learning goal pursuit. The results showed that both learning belief and learning goal pursuit varied significantly depending on the learners' level of digital proficiency. This indicates that the levels of these two psychological factors were not uniform across different levels of digital learning tool proficiency. Based on Pillai's trace, the analysis revealed a statistically significant difference, with an F-value of 10.900 at a significance level of $p < 0.001$.

Table 4. Multivariate Test for the Effect of Digital Learning Tool Proficiency

No.	Test Type	Value	F	p	η^2
1	Pillai's Trace	0.223	10.900	0.000	0.111
2	Wilks' Lambda	0.782	11.389	0.000	0.116
3	Hotelling's Trace	0.273	11.839	0.000	0.120
4	Roy's Largest Root	0.251	21.809	0.000	0.200

When comparing the influence of digital learning tool proficiency on the two dependent variable learning belief and learning goal pursuit—it was found that the impact on learning goal pursuit ($F = 20.480$) was relatively greater than its effect on learning belief ($F = 14.570$). Furthermore, the results were statistically significant at the $p < 0.001$ level. The explanatory power for learning belief was 0.143 (14.3%), while that for learning goal pursuit was 0.190 (19.0%).

Table 5. Effects of Digital Tool Proficiency on Learning Belief and Learning Goal Pursuit

No.	Dependent Variable	Mean Square	F	p	R^2
1	Learning Belief	8.277	14.570	0.000	0.143
2	Learning Goal Pursuit	6.776	20.480	0.000	0.190

5. Discussion

This study sought to identify practical strategies to support adult learners in utilizing digital learning tools effectively in higher education. Based on the quantitative findings, several key insights emerged.

First, although adult learners generally demonstrated a positive and active attitude toward learning ($M = 4.02$), their effort to acquire new knowledge was comparatively lower ($M = 3.87$). Similarly, while they showed relatively high persistence in striving toward academic goals ($M = 4.07$), their confidence in independently setting academic goals was somewhat weaker ($M = 3.98$). These results suggest that adult learners may experience challenges in systematic self-regulation, particularly when it comes to adopting unfamiliar technologies such as digital tools or establishing clearly defined academic objectives. In a related study, Ditlhale and Geesje (2024) also found that while adult learners are aware of the benefits of digital learning tools, they often struggle to use them proficiently. They emphasized that educational institutions must develop alternative approaches to address this gap.

Second, the study confirmed a significant generational gap in digital learning tool proficiency among adult learners. Specifically, younger adults in their 20s and 30s demonstrated the highest levels of digital proficiency ($M = 4.30$ and 4.16, respectively), followed by middle-aged adults in their 40s and 50s ($M = 3.76$ and 3.58), while older adults in their 60s reported the lowest proficiency ($M = 2.81$). These results support Hypothesis 1 and align with previous research emphasizing generational disparities in digital literacy and learning readiness (Kim & Choi, 2020; Morgan et al., 2022). These findings challenge the assumption that all students, regardless of age, possess comparable digital skills upon entering higher education. In line with Merriam and Baumgartner (2020), this study reaffirms that substantial variations in digital readiness persist not only between younger and

older learners, but also within adult learner populations themselves. Therefore, if digital tool proficiency is to be regarded as a prerequisite for academic success, institutions must assess students' digital readiness early and offer tailored support. Providing equitable opportunities for digitally underprepared learners is essential to reduce educational inequality and promote inclusion.

Furthermore, the findings highlighted the impact of learning motivation on digital learning tool proficiency. Adult learners demonstrated varying levels of proficiency depending on their primary reason for university enrollment. Those motivated by social networking goals exhibited the highest proficiency, suggesting that their digital engagement in online communication and relationship-building may have translated into stronger digital competencies.

Similarly, learners who enrolled for personal enjoyment or career and job development purposes reported high proficiency levels. Conversely, learners driven by a pure passion for learning showed the lowest digital proficiency, underscoring the need for differentiated instructional strategies. Even when learners are highly intrinsically motivated, inadequate digital skills may lead to frustration or disengagement, ultimately affecting persistence and learning outcomes.

In relation to Hypothesis 2, this study found that digital learning tool proficiency had a significant positive effect on both learning belief and learning goal pursuit. These results emphasize the importance of providing not only technical training but also attitudinal support to enhance academic success (Madsen et al., 2015; Peterson et al., 2003). In particular, digital proficiency had a stronger explanatory power for learning goal pursuit ($F = 20.480$) than for learning belief ($F = 14.570$).

Given that adult learners' goal-setting attitudes were found to be relatively weak ($M = 3.98$) but positively influenced by digital proficiency, these findings indicate that instructional strategies should prioritize the development of goal-setting skills in conjunction with technical training. Supporting adult learners' belief in their capacity to set and pursue academic goals can serve as a key mechanism for fostering motivation and perseverance in digital learning environments.

Taken together, these findings suggest that institutions must cultivate both digital competencies and adaptive learning attitudes to strengthen academic performance and engagement among adult learners. Given that adult learners often navigate higher education with greater autonomy and complexity than their younger counterparts, it is essential that universities adopt differentiated and personalized educational strategies. Recognizing the unique needs of adult learners and providing timely, targeted support can enhance not only digital adaptation but also persistence and success in higher education.

6. Conclusion

This study explored how digital learning tool proficiency among university adult learners is shaped by motivational factors and learning attitudes. By investigating generational and motivational differences, the findings illuminate key learner

characteristics that higher education institutions must address through tailored instructional strategies.

The results revealed significant age-related disparities in digital tool proficiency, with younger adults demonstrating stronger skills. Notably, digital proficiency was positively associated with goal pursuit and learning beliefs—underscoring the importance of both technical training and attitudinal support. These findings align with the skill acquisition–attitude change–outcome achievement model (Peterson et al., 2003) and highlight the transformative potential of digital skill development for adult learners.

The Korean context illustrates broader challenges. While the country ranks 6th globally in digital competitiveness, it lags behind in individual digital skills, ranking 48th (IMD, 2023). Older learners in particular showed low digital readiness, reinforcing national policy concerns about digital equity. In response, universities must not treat digital tools as barriers but as catalysts for inclusive academic engagement.

To promote success, institutions should adopt differentiated support systems. Informal learning approaches—such as gamified microlearning, peer mentoring, and community workshops—can enhance digital confidence. At the same time, structured tools like digital progress dashboards help adult learners clarify and pursue academic objectives. These strategies must be embedded within a socially inclusive, lifelong learning framework (Helsper & Eynon, 2021; Merriam & Baumgartner, 2020). Overall, this study emphasizes the need for comprehensive, context-sensitive support to ensure adult learners thrive in digital higher education environments. Future research should examine how learners' home, work, and community contexts shape their digital learning readiness and identify effective interventions that foster equitable access, sustained engagement, and career-aligned academic success.

Despite the meaningful contributions of this study, several limitations must be acknowledged. First, all data were collected via self-report questionnaires, which may be subject to response biases such as social desirability or inaccurate self-assessment. Triangulating self-reported data with objective measures—such as digital log data or performance-based assessments—would enhance the robustness of future research. Second, the sample was drawn from a single Korean university offering adult-focused programs, which limits the generalizability of the findings. Therefore, future studies should consider more diverse institutional settings, including community colleges, online universities, and non-formal education platforms. Acknowledging these limitations provides a foundation for more rigorous and inclusive investigations in the field of adult digital learning.

7. References

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