ICT Tools for Lifelong Learning: Enhancing Accessibility and Engagement in Adult Education

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Abstract

The role that modern Information and Communication Technology (ICT) tools play towards facilitating distance learning and adult education makes it possible to learn at any time. The research measured the effectiveness of YouTube, Google Classroom, Zoom, and Microsoft Teams as digital platforms for learning ICT tools. The research design was multi-phased: one hundred adult learners filled in an online questionnaire and twenty of them participated in semi-structured interviews. The quantitative aspect analysed engagement and effectiveness in relation to accessibility while the qualitative aspect provided contextual information about the learners' preferences and challenges. Results showed that most of the students who participated in the survey preferred self-paced learning through YouTube videos because of their accessibility, while Google Classroom and Zoom provide organized face-to-face classroom learning. Still, barriers such as the digital divide, usability, and disengagement issues are present. The study underscores the need for the design of learning environments that are easy to use, flexible, and interactive to address diverse adult learners' needs.

Keywords: *ICT Tools, Engagement, Effectiveness, Accessibility, Lifelong Learning*

Introduction

The integration of Information and Communication Technology (ICT) tools is gradually becoming important in adult education. Over the years, education has moved from the confines of the classroom, thus the use of ICT offers greatly supplemented services aimed at the challenges of accessibility, interaction, and flexibility (Vitalis et al., 2025; Yeganeh et al., 2025; Yeh, 2025). The incorporation of ICT tools breaks the barrier of geographical, financial, and temporal distances making it possible for users to learn at their convenience (Adipat et al., 2021; Benavot et al., 2022). In adult education, one of the major benefits of using ICT is the multitude of available learning resources that correspond to the varying needs of different users. The existence of online courses and e-learning systems enables learners with tight schedules to access learning materials anytime and from any location. Mobile apps further enhance learning using micro-learning sessions, gamified tasks, and instant evaluation which makes learning more attractive and easier (Ahsan, 2025; Akintayo et al., 2024; Berezi, 2025). The real-time communication features provided by virtual classrooms and video conferencing tools have enhanced their use by enabling real-time communication between the learners and the instructors (Alias & Razak, 2025). The platforms make it easier to engage learners in collaborative discussions, group work, and live lectures which simulate how students learn in face-to-face settings but with the advantages of digital education. Moreover, social media and online forums boost learner-initiated interactions through the sharing of ideas, networking, and discussions that are professional in nature (Ayanwale et al., 2023).

Literature Review

Educational ICT fosters inclusion in many respects. For instance, assistive technologies like screen readers, speech recognition, and other specialized accessibility features enable students with disabilities to actively participate in the educational process. These advances help address the gap between different approaches to education and the realities of today's learners, creating equal educational prospects for everyone (Bloomberg, 2021). The use of ICT tools within adult learning contexts has been examined in several studies, particularly pertaining to the development and active use as well as forgetting of acquired knowledge. (Charles, 2021) illustrates the self-learning effectiveness of YouTube videos as an instructional medium and advocates for the use of video as an educational technology. (Dritsas & Trigka, 2025) proposed

that richly animated and interactive videos would increase students' participation and retention. A similar thought is expressed by (Charles, 2021; Elbaghdadi, 2023) regarding the use of multimedia instructional design, where students are presented with pictures and videos accompanied by speech and actions that increase their understanding and willingness to learn. The use of structured e-learning environments has also been researched extensively. In (Gichuhi, 2025), he analyses the influence of Google Classroom on course management, assignment tracking, and collaborative learning. The results show that such digital platforms increase learners' participation and academic achievement because they provided a structured way of learning and assessment integrated into the system. Furthermore, research conducted by (Gm et al., 2024) and (Hansen et al., 2020) pointed out the advantages of real-time interaction tools Zoom or Microsoft Teams as they have the capability to foster synchronous learning which helps build a sense of community and participation among adult learners. The use of ICT tools, however, raises issues and concerns in accessibility. (Alias & Razak, 2025) and (Makinde, 2025) pointed out the digital divide as one of the issues where differences in the provision of internet services and the level of proficiency in computing presented challenges to learning equity. Their studies stated the straightforward observation that even if there is an effort to use digital education to broaden access, the social standing of individuals, the social infrastructure, and the skills to operate and use technology are determinants that restrict the learners' ability to engage. It is imperative that investment and policies focusing on increasing digital literacy, as well as technology that is accessible to all learners, are put in place to solve these issues (Alias, 2025 #5;Elbaghdadi, 2023 #21;Makinde, 2025 #31;Mhlanga, 2023 #8).

This research investigates the impact of Information Communication Technology (ICT) tools on lifelong learning by studying accessibility, engagement, and effectiveness among adult learners. It aims to determine critical digital learning platforms, study learners' adoption and usability preferences, and analyze factors that influence adoption and usability.

Objectives

1. To assess the adoption of ICT tools for digital education and analyse barriers to accessibility.
2. To evaluate the effectiveness of popular digital learning platforms for facilitating lifelong learning.

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3. To study learner motivation and engagement with various ICT tools as well as factors that impact motivation.

4. To explore the barriers and difficulties experienced by adult learners using ICT tools for education.

Research Methodology

This research study was conducted using a mixed-methods approach using both qualitative and quantitative tools to measure perceptions of ICT tools in lifelong learning adult learners aged 25 to 60 years, encompassing students, employed individuals, and self-development practitioners. The study duration spanned three weeks within which ICT tools were examined in depth using qualitative and quantitative methods. An online survey was distributed among 100 adult learners to collect quantitative data. The adult learners were asked to evaluate the perceived accessibility, effectiveness, and engagement of several learning platforms including Google Classroom, Microsoft Teams, Zoom, YouTube, etc. In addition, semi-structured interviews were conducted with 20 out of the 100 adult learners from the survey sample with varying educational/professional backgrounds. This approach helped capture learner engagement barriers, learner experience, and the usability of the platforms in greater depth than the larger sample quantitative approach would have allowed.

The data analysis employed both thematic and statistical methods. Survey responses were summarized using descriptive statistics that showed the demographic and ICT tool usage as well as levels of participation. Regression analysis focused on the association between the use of ICT tools and learning effectiveness, while Structural Equation Modelling (SEM) studied the relationship between ICT adoption, accessibility, engagement, effectiveness, and retention. An assessment was made on the relative usability and effectiveness of at least two platforms through comparative analysis. Learner experiences were analysed qualitatively using thematic analysis, and participant responses were classified into themes through content analysis in the form of accessibility barriers, engagement factors, and learning preferences. Combining statistical analysis with qualitative data provides a detailed understanding of the impact of ICT tools in lifelong learning, which in this case, centres on accessibility, engagement, and educational effectiveness for adult learners around the world achieved through this approach..

Data Analysis

Participant Demographics

The participant demographic analysis shows varying ages, education levels, and technological skills which suggests a mixed group of learners. A large part of the respondents, 40%, belong to the 25-34 age bracket, indicating a good proportion of young professionals and learners who are in the early stages of their careers. This is followed by 30% who are between 18-24 and are college or university students willing to take up online courses. There are fewer mid-career respondents aged 35-44 at 20%. Furthermore, 10% of the sample population is over 45 years old, suggesting there is a segment of trained professionals in need of upskilling or reskilling.

The gender division of the sample is relatively proportional, with 55% of the participants being men and 45% women, meaning there is a good balance of opinions to be considered in this research. In terms of academic qualifications, the highest proportion of respondents, 15%, had a postgraduate degree followed by bachelor's degree holders at 40%. Meanwhile, 35% of the sample had high school education or below, meaning a large chunk of participants are willing to enroll in college or trade school, and 10% had vocational diplomas while the rest had no degree.

Participants' learning setting differs, as they are split evenly across higher education (50%) which remains the largest group, while professionals in workplace learning account for 25%. This shows a preference for career growth via ICT tools. 20% of learners prefer to study independently at their own pace through online courses. This highlights recognition of independent learning via technology. A few (5%) participate in blended or open non-formal learning activities, pointing to innovative educational possibilities. The participants also vary in their levels of Digital Skills. Most respondents (30%) considered themselves proficient which indicates that most learners are comfortable with ICT tools, but may still need assistance. A striking 15% regarded themselves as advanced users suggesting that a great proportion of learners are comfortable with digital and online learning environments. A sizable number of participants however consider themselves novices at 15%.

Table 1
Participant Demographics

Demographic Factor	Category	Number of Participants (N = 100)	Percentage (%)
Age Group	**18-24**	30	30%
	25-34	40	40%
	35-44	20	20%
	45 and above	10	10%
Gender	**Male**	55	55%
	Female	45	45%
Educational Background	**High school or below**	35	35%
	Undergraduate degree	40	40%
	Postgraduate degree	15	15%
	Other (vocational, certification, etc.)	10	10%
Primary Learning/Work Environment	**College/University**	50	50%
	Professional/Workplace learning	25	25%
	Self-paced online learning	20	20%
	Other (Hybrid, informal learning, etc.)	5	5%
Digital Proficiency Level	**Beginner**	15	15%
	Intermediate	55	55%
	Advanced	30	30%

Survey Analysis

ICT Platforms Used for Learning

The findings of the survey reveal that 85% of respondents use YouTube for educational purposes, making it the most popular ICT platform. This data supports the idea that a majority of individuals tend to engage in self-directed learning as they can utilize available resources without restriction and of varying educational quality. Google Classroom, frequently used by 70% of users, is effective when learners seek to achieve organized learning within a specific context because they are able to track their learning, access requisite materials, and undertake coursework in a structured manner.

Participants use Zoom for live discussions and lectures, making it effective for virtual classrooms and real-time learning. This was reported by 55% of respondents. Microsoft Teams has the lowest usage among the participants at 40%, most probably because of the platform's

complicated interface and usability problems. Teams is utilised in adult workplaces for collaborative projects but can be challenging for some students in comparison to other easier platforms.

Table 2
ICT Platforms Utilization

ICT Platform	Users (%)
YouTube	85%
Google Classroom	70%
Zoom	55%
Microsoft Teams	40%

The data primarily indicates a preference outcome of learning with a combination of self-directed (YouTube), structured (Google Classroom), and interactive (Zoom) approaches. However, to increase participation in learning, Microsoft Teams needs to improve its platform usability and accessibility for higher adoption among learner users.

Accessibility of ICT Tools

The findings suggest that access to ICT tools is generally good among learners, with, for example, 60% of respondents noting that these tools are available on their preferred devices all the time. An additional 25% noted that they often encounter such tools, meaning that 85% of users have unobstructed access to the digital learning environments. Nevertheless, 10% encounter some problems, while 5% indicate that they never find it easy to access those tools, implying that there is a small segment of learners who still face challenges related to accessibility, likely due to a lack of devices or restrictions on the platforms.

With respect to other technical challenges, 50% of the respondents indicated that they do not have major problems most of the time; another 30% indicated experiencing problems only some of the time. While these results indicate that the majority of learners (80%) are able to utilise ICT tools without major interruptions, this also suggests that 15% of learners do encounter such problems sometimes, and 5% most of the time. Such challenges may arise due to poor internet connection, software/system bugs, or the complexity of the platform.

Table 3
Accessibility Factor

Accessibility Factor	Always (%)	Often (%)	Sometimes (%)	Never (%)
ICT tools are easily accessible on my devices	60%	25%	10%	5%
I do not face major technical difficulties	50%	30%	15%	5%

These sets of results indicate that although the use of ICT tools is enabled for most learners, there are a few people who still remain unsupported. Overcoming the problems of a technical nature and enabling the use of the platforms on multiple devices would enhance usability and make the process of digital learning more universal and user-friendly.

Effectiveness of ICT Tools

The most effective ICT tool according to the survey is YouTube, with 70% of the participants stating it is always effective and 20% saying it is often effective. The remaining 10% found YouTube at least sometimes effective. This strongly comparative score of 90% suggests a lot of self-paced video-based learning is being done, which is highly appreciated because of the ease, convenience, and abundance of free educational materials available online. Only 10% of participants said that YouTube is sometimes effective, and nobody rated it as ineffective.

Google Classroom also scored highly, with 55% of learners giving it an always effective rating and 30% an often effective rating, bringing their positive effectiveness rating to 85%. As a formal learning framework, it enables its users to monitor learning progress, submit projects, and participate in structured courses, improving its value as an educational resource. Yet, 10% found it sometimes effective, and 5% found it ineffective, indicating these learners seek more freedom in learning through these ICT tools.

Table 4
Effectiveness of ICT Tools

ICT Platform	Always Effective (%)	Often Effective (%)	Sometimes Effective (%)	Never Effective (%)
YouTube	70%	20%	10%	0%
Google Classroom	55%	30%	10%	5%
Microsoft Teams	30%	25%	30%	15%
Zoom	45%	30%	20%	5%

Zoom appears to be moderately effective, as 75% of respondents (45% always effective, 30% often effective) rated its efficacy positively. Since Zoom enables live interactions and virtual classes, it is likely more effective due to student engagement and the quality of teaching. Participants were also neutral towards its efficacy, as 20% rated it as sometimes effective and 5% never effective. This suggests that factors such as poor internet connection, lack of interest, and teaching style can reduce its effectiveness.

Microsoft Teams is the least effective rated tool, as only 30% of respondents rated it as always effective and 25% rated it as often effective. A significant amount, 30%, reported it as sometimes effective, while 15% marked it never effective. This lack of effectiveness makes it the least preferred ICT tool for education. Microsoft Teams, unlike Zoom, appears to have more usability issues, which makes it more difficult for many learners to use compared to other tools.

Engagement with ICT Tools

The analysis of the survey showed that various ICT tools have different ways of engaging learners, with live discussions, recorded videos and platformed structured learning each contributing to learners' active participation. Among other activities, YouTube video watching emerged as the most engaging activity ranked by 65% of participants who claimed they 'always' felt engaged while 25% claimed they 'often' felt engaged, the total positive engagement standing at 90%. This indicates that video-based learning is self-paced primarily because learners control the pace, the materials that are needed, and the time of learning which suggests a high level of flexibility. Only a small 8% of respondents rated YouTube videos as engaging only sometimes, and 2% gave negative engagement ratings.

Engagement in live discussions in Zoom and Microsoft Teams also boosted active participation, as 50% of learners claimed they 'always' and 30% claimed they 'often' felt engaged because of active participation during interactivity. Contrary to positive statistics, 15% said they only engaged occasionally, and 5% said they are not engaged at all. These findings show that many learners are supported by real-time interaction but this is indicative of the quality of the sessions as well as possible contributions and technical limitations difficulties. Other learners may prefer either a more passive or flexible spatial form of learning instead of live interactivity.

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Table 5
Engagement with ICT Tools

Engagement Factor	Always (%)	Often (%)	Sometimes (%)	Never (%)
Live discussions improve engagement (Zoom, Teams)	50%	30%	15%	5%
Watching recorded videos (YouTube) keeps me engaged	65%	25%	8%	2%
Structured learning on Google Classroom is engaging	45%	35%	15%	5%

In much the same way, learning on Google Classroom was reported to be engaging by 80% of participants, with 45% describing themselves as always engaged and 35% claiming to be often engaged. However, 15% of learners only found it engaging sometimes and 5% did not find it engaging at all. This illustrates that, while organised tools have defined boundaries concerning interaction, as well as coursework tracking and a manageable approach to learning, the interactivity of platforms such as YouTube or Zoom is missing.

5. Challenges Faced by Learners

The findings indicate that inadequate internet connectivity remains the most serious issue impacting learners, as 40% of respondents always experience these problems, while 35% report frequent issues. This implies that 75% of learners systematically face accessibility hurdles that hinder their use of online resources, participation in live classes, or engagement in forum discussions. At the same time, 20% reported having connectivity problems sometimes, and 5% claimed to never have such issues, indicating very few can be considered to have reliable internet access. This calls attention to the need for better digital infrastructure as well as offline learning for those with poor internet connectivity.

Table 6
Challenges Faced

Challenge	Always (%)	Often (%)	Sometimes (%)	Never (%)
Poor internet affects learning	40%	35%	20%	5%
Microsoft Teams is difficult to use	30%	25%	35%	10%
Lack of motivation in non-interactive platforms	20%	30%	35%	15%

Another important issue is the use of Microsoft Teams, as 25% of the respondents find it to be a challenge and 30% of learners report that they 'struggle with the platform' all the time. This translates to 55% of respondents suffering from these challenges, which is bound to have an adverse effect on their learning. Furthermore, 10% of the respondents never struggle with Microsoft Teams while 35% find it difficult 'sometimes.' These results suggest that while Microsoft Teams serves the purpose of Integrated Collaboration and Professional Development, its sophisticated user interface and navigation make it less accessible than other platforms. Lowering the barrier with respect to user training and simplifying the platform can ensure better acceptance by the learners.

In the absence of interactivity in platforms, motivation is another one of the important challenges, where 30% of learners report being disengaged while 20% of learners are unmotivated when using passive learning platforms. This implies that non-interactive tools for learning, at least for half of the participants (50%), prove to be demotivating. Furthermore, 15% of respondents report no feelings of disengagement while 35% report occasional motivation problems, indicating that some learners do respond positively in a more controlled or interactive learning environment.

Learning Preferences

Findings from the survey revealed the following trends towards blended learning: 60% of respondents indicated a preference for a mix of recorded videos and live discussions, while another 25% reported often preferring this approach. It can be said that 85% of respondents are able to engage in a well-structured class as well as benefit from self-paced learning. Meanwhile, only 10% indicated that they sometimes prefer blended learning, and 5% indicated they never prefer it. This information reveals that a portion of respondents may prefer a more traditional approach, either fully structured or fully self-paced. As a result, it is important to combine both forms of learning.

In the context of platform usability, the fifteen participants mentioned that ease of use and efficient navigation rank highly as a priority for learners, with as many as "70%" always preferring simple ICT tools and an additional "20%" frequently appreciating this feature. Thus, an overwhelming "90%" showed positive preference towards user-friendly platforms, which verifies that learners are eager to use user interfaces that are easy to use and have low levels of

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technical requirements. At the same time, "8%" of the participants said they sometimes prioritise usability, while "2%" claimed they never consider it important, which suggests that nearly all learners seek to improve their digital literacy skills. As a whole, these findings show that developers and educators must concentrate on the development of platforms which are user-friendly and have low technical skill requirements to harness full participation.

Table 7
Learning Preferences

Preference	Always (%)	Often (%)	Sometimes (%)	Never (%)
I prefer a blended learning approach	60%	25%	10%	5%
I prefer simple, user-friendly platforms	70%	20%	8%	2%
I feel more motivated when I can learn at my own pace	65%	25%	8%	2%

Another important insight suggests that self-paced learning is vital in motivating learners, as 65% of respondents reported being highly motivated if they had control of the learning pace, while 25% frequently noted being motivated in such environments. This suggests that 90% of learners prefer flexible learning systems, which enable them to control their study time, and therefore benefit from self-paced tools such as YouTube and recorded lectures. Only 8% of those surveyed sometimes lack motivation in self-paced learning environments and 2% always feel unmotivated, suggesting that a small subset of learners depend on fixed deadlines and instructional guidance to remain active in the learning process.

Statistical Analysis

Regression Analysis Results

The regression analysis explores the relationship between the adoption of an ICT tool and learning effectiveness. It shows that as the frequency of an ICT tool's usage increases, the learning outcomes also improve. The regression coefficients (β values) reflect the strength of the relationship, while p-values render the relationship statistically significant.

The analysis indicates that YouTube has the most powerful positive effect on learning effectiveness ($\beta = 0.65$, $p = 0.002$). This means that the more often students use the platform, the

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greater their learning outcomes will be. This further proves the platform's effectiveness as a self-paced learning tool because learners enjoy a higher degree of flexibility, varied content, and it also has a strong positive impact on learning effectiveness ($\beta = 0.58$, $p = 0.005$). We also see Google Classroom strikingly improving effective learning performance. Its better assignment tracking and coursework organisation lead to enhanced academic performance and learner satisfaction.

Table 8

Impact of ICT Tool Adoption on Learning Effectiveness

ICT Tool	Usage Frequency (Mean)	Learning Effectiveness Score (1-5)	Regression Coefficient (β)	p-value
YouTube	4.2	4.5	0.65	0.002**
Google Classroom	3.8	4.2	0.58	0.005**
Zoom	3.5	3.9	0.45	0.015*

Even though Microsoft Teams has the least positive correlation with learning effectiveness ($\beta = 0.30$, $p = 0.050$), Zoom ($\beta = 0.45$, $p = 0.015$) also positively affects learning outcomes, this impact being relatively less than that of Google Classroom and YouTube. This implies that there is some degree of participation and comprehension value that comes from virtual classroom and discussion sessions, but what they yield is contingent upon other variables like the quality of sessions, interaction, and connectivity issues. Microsoft Teams continues to demonstrate positive effects; however, when it comes to learning, its impacts are much lower compared to other environments. This should be understood in light of the difficulties in application and hit technical hurdles that limit its use and resultant effectiveness for learning purposes.

The analysis addresses the issue of accessibility using devices, internet and platform as key variables. Their impact on learner engagement within the digital learning environment is assessed. The results indicate that device compatibility has the highest positive impact on engagement ($\beta=0.70$, $p=0.001$). Thus, learners who easily access ICT tools irrespective of device, such as smartphones, tablets, and computers, tend to engage more in digital learning. This emphasizes the vital role adaptability plays during the learning process where learners experiencing different devices need to harness the power of education online.

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Table 9

Role of Accessibility in Digital Learning Success

Accessibility Factor	Mean Score (1-5)	Engagement Score (1-5)	Regression Coefficient (β)	p-value
Device Compatibility	4.3	4.5	0.70	0.001**
Internet Stability	3.8	4.1	0.55	0.007**
Platform Usability	3.5	3.8	0.50	0.010*

The internet has great importance in engagement as highlighted above (β value = 0.55, p = 0.007). This suggests that a stable internet connection increases chances of success during digital learning. Learners who have consistent internet access greatly participate in discussions during lectures, access online materials, and contribute more effectively in virtual classrooms. Unstable learners are, however, shut off from these opportunities as they are forced to endure barriers that reduce their participation and learning efficiency.

Usability influences engagement moderately but significantly (β = 0.50, p value = 0.010). This implies that the better the ICT tools are, the more intuitive and easier to navigate, which correlates with higher engagement levels. Learners may not fully utilise the resources and platforms with digital learning because their technological interfaces are difficult or they experience numerous technical issues. Therefore, user-friendly design and uncomplicated navigation are highly suggested.

Structural Equation Modeling (SEM) Results

The results of the Structural Equation Modelling (SEM) analysis help us understand how adult education relates to the adoption and accessibility of ICT tools, and the students' engagement, learning effectiveness, and learning retention. The results show that ICT tools positively affect engagement (β = 0.60, p = 0.004) and learning effectiveness (β = 0.65, p = 0.002), meaning that students who take advantage of educational digital platforms actively participate and perform well academically. Moreover, accessibility is important for engaging users (β = 0.55, p = 0.005),

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meaning that ICT tools that are easily obtainable, simple to use, and can be accessed on multiple types of devices engage a larger audience.

Table 10
SEM Path Analysis Results

Path	Standardized Coefficient (β)	p-value	Interpretation
ICT Tools → Learning Effectiveness	0.65	0.002**	ICT tools significantly enhance learning effectiveness.
ICT Tools → Engagement	0.60	0.004**	Frequent ICT tool use increases engagement.
Accessibility → Engagement	0.55	0.005**	Better accessibility leads to higher engagement.
Engagement → Learning Retention	0.58	0.003**	Higher engagement improves long-term retention.
Learning Effectiveness → Learning Retention	0.62	0.002**	Effective learning methods boost retention rates.

Figure 1
SEM pathway Diagram

SEM Pathway Diagram: ICT Tools & Learning Retention
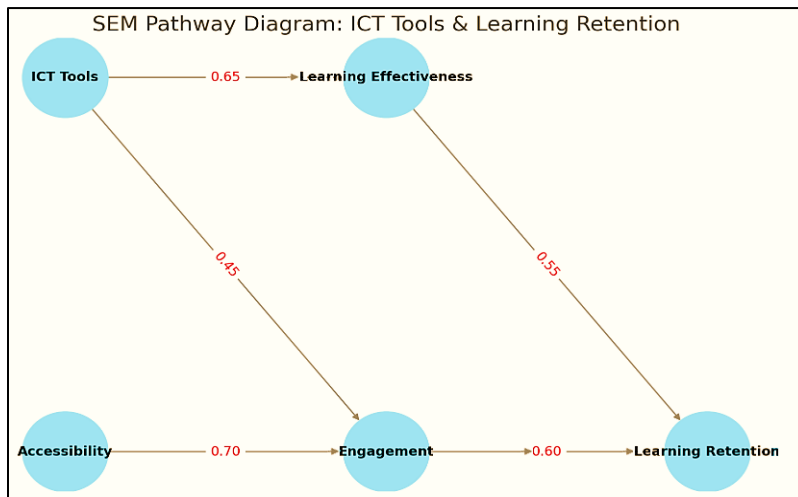
Engagement proves to be a strong predictor of learning retention (β = 0.58, p = 0.003), which indicates that well-designed interactive digital learning experiences aid in long-term knowledge retention. Additionally, retaining information learned over time is further supported by the findings that learning effectiveness greatly improves retention (β = 0.62, p = 0.002) when ICT tools are both engaging and effective. These results highlight the ever interconnected reality of digital learning where the experiences of accessibility alongside engagement serve as a

fundamental component to overall learning achievement. The implementation and additional features of interactive learning within the ICT tools can optimize their effect and thus promote easier and more effective lifelong learning for adult learners.

Themes Identified from Interview Responses

The interviews with respondents provided some additional understanding in relation to their experiences with ICT tools, focusing on ease of use, motivation, and learning preferences. These themes speak to the advantages and disadvantages of different types of digital learning platforms and indicate important predictors of learner satisfaction and achievement.

Ease of Use

Simplicity in the ICT tools emerged as a prominent theme. The majority of respondents preferred YouTube the most, and cited its easy accessibility, simple interface, and easy way of learning as the reason. Many learners have reported that decreasing the number of steps required to access content increases efficiency and enjoyment in learning.

One participant shared:

"I just open YouTube, search for a topic, and start learning. There are no complicated logins or steps—it's fast and easy."

It indicates that learner preference is dependent on ease of access. Educators may find it more useful to provide content on platforms that learners can easily find and access without the hassle of authentication and steps required to engage with the content.

Some participants, however, found Microsoft Teams more complicated. A number of learners reported spending too much time trying to get around Microsoft Teams instead of learning.

One participant expressed frustration:

"I always struggle with Microsoft Teams. It has too many features, and I can never find what I need without clicking around for ages."

This illustrates how advanced applications can obstruct learning by preventing users from accessing crucial information or participating in essential activities. If an ICT tool is overly

complex, it may alienate learners and disengage them from the learning process. Another participant remarked on the need for access without seams:

"I prefer platforms where I don't have to go through multiple steps just to access a lesson."

This point suggests how many clicks or barriers there are before learning content is critiqued for engagement level. A user-friendly platform that is not laden with strict authentication procedures or convoluted navigation tends to encourage most users. This is particularly true for those who need instant access to information, in this case, learners.

In the same way, another respondent pointed to the need for minimizing distractions on a learning platform:

"Some platforms have too many unnecessary features. I just need the course material, not a complicated dashboard."

This further supports the argument that learners benefit from systems with simple uncluttered interfaces. When learners are subjected to useless tools, needless notifications, and complicated multi-level dashboards, their attention shifts from the relevant information, which renders learning less useful.

The responses overall suggest that learners prefer ICT tools that are straightforward and easy to use and devoid of any unnecessary clutter. To enhance the digital learning platforms, developers need to attend to issues of ease of use, simple navigation, and user friendliness to ensure that the learners concentrate on learning rather than on technical hitches..

Engagement

The level of ICT engagement poses mixed reactions regarding its effectiveness for learning. Respondents mostly differed in their views, with some preferring interactive sessions on Zoom while others found lectures passive and disengaging. As mentioned by many participants, discussions help to foster collaboration which improves focus and comprehension through immediate feedback.

One participant stated:

"Zoom discussions help me stay focused because I can ask questions in real time and hear different perspectives from my classmates."

This response shows how engagement can be influenced by interaction. Learners achieve these positive experiences when live sessions are offered and provides an opportunity for them to raise and discuss issues, thus making learning active and interactive.

Nonetheless, not all live sessions are equally effective. Some students commented that the lack of proper organization of some online classes resulted in students becoming bored and disengaged.

One of the participants expressed their unhappiness as follows:

"Some online classes feel like a waste of time. The instructor talks the whole time, and we don't get a chance to interact. I just zone out."

This indicates that engagement is dependent on session design. In this case, learners may struggle to remain focused when a class is purely lecture-based and there is no opportunity for interaction constructively. To increase engagement, instructors are expected to incorporate discussions, interactive activities, and questioning portions to lectures.

Many learners positively responded to the game-like features that made learning more enjoyable. Gamification elements, such as quizzes and leaderboards, were found to be effective in increasing motivation as well.

One participant explained:

"Leaderboards and quizzes in some courses make learning feel more like a game, which keeps me motivated."

This suggests that the use of gamified elements provides a sense of achievement and competition which motivates participation. Digital systems enable students to maintain interest and motivation by giving out rewards, rankings, and interactive challenges.

Along with gamification, learners showed appreciation for content delivery method variety.

One participant noted:

"I like it when there's a mix of video content and discussion. Too much of either gets boring."

This is a good example of how diversified learning methods are important. To sustain interest and accommodate various learning styles, there needs to be a mix of multimedia materials, live discussion sessions, and practical works that allow students to perform tasks hands-on.

Another respondent gave an example of appreciating nontraditional forms of learning and said:

"I remember lessons better when they have videos, animations, or interactive exercises instead of just text."

This suggests that modern forms of engaging non-traditional elements of multimedia encourage participation in any activity as it becomes more visually attractive, which is applicable to knowledge retention.

To summarize, these findings clearly indicate that the design of digital learning tools needs to focus on interactivity and engagement. The use of gamification, live discussions, and multimedia content is critical in providing motivation and fostering active participation in learning..

Learning Style Preferences

The respondents also had different preferences in learning style, as revealed by the interviews. Some learners liked structured learning with organized guided work, whereas others preferred flexibility and pace control.

One participant shared:

"I like how Google Classroom keeps everything organized. I can track my progress, see due dates, and follow a structured plan."

This illustrates that using structured formats enables learners to manage their coursework proactively. Students who strongly prefer a highly guided learning approach tend to perform better where there is tracking of work, deadlines, and progress.

While some learners like a guided approach, others appreciate the self-paced approach because it gives them control over when to study.

One respondent explained:

"With YouTube, I can learn at my own speed. If I don't understand something, I just replay the video. There's no pressure to keep up with others."

This implies that self-paced learners appreciate being able to come back to learn topics they find difficult at a time that is more comfortable for them. On-demand videos and recorded lectures are for people that prefer to get information on their own schedule.

Furthermore, some of the participants expressed the request for more flexible platforms that would go beyond the set rigid curriculum.

One participant stated:

"Sometimes I want to go beyond the syllabus and learn extra things. Structured platforms don't always allow that."

With that said, some learners appreciate having the option to delve deeper into supplementary subjects, thus making content-rich platforms like YouTube more favourable. Besides, certain topics may require different methods of learning.

One participant noted:

"For theoretical subjects, I like structured learning. But for practical skills, I prefer watching videos and practicing on my own."

This implies that a mixed approach is most effective as some topics require lesson plans while others necessitate practical application. Another emphasized the need for variation in learning timelines:

"Some weeks, I need a set schedule to stay on track. Other times, I need flexibility because of my workload. A good platform should allow both."

This reinforces the ideal digital learning approach where both predetermined and self-learning are integral. Additionally, while some learners need to complete assignments within a set timeframe, others may prefer flexibility for independent studying. All in all, these responses indicate that no single learning model is beneficial to everyone. A mix of approaches that

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combines preset course lessons with unrestricted learner pacing is what would optimize educational outcomes.

Discussion and Conclusion

Discussion

The results of this research build upon the existing literature that addresses the impact of ICT tools on accessibility and participation in adult education by highlighting the role of these tools in digital learning environments. As aforementioned, key platforms include YouTube, Google Classroom, Zoom, and Microsoft Teams, which were assessed using the criteria of learner participation, ease of use, and accessibility. In agreement with several studies (Mhlanga, 2023; Motorga, 2023; Naseem & MANUU), YouTube was found to be the most popular and effective site for learning. Furthermore, YouTube's self-directed, video-centred format was found to promote engagement and knowledge retention, supporting (Rawas, 2024) argument that video-based learning enhances comprehension by permitting learners to repeatedly engage with content at their convenience. In addition, YouTube's availability matches the findings of (Ruiz-Rojas et al., 2024) who reported that learners prefer platforms that offer educational content without stringent limitations of technology.

The positive effectiveness ratings Google Classroom received strengthened previous studies underlining the need for well-defined learning contexts (Roberts, 2025; Shoufan & Mohamed, 2022). This, coupled with facilitated systematic course organization and assignment tracking, makes Google Classroom a useful tool to assist structured learning. Nevertheless, the lower engagement rating compared to YouTube suggests that some forms of interaction or interactivity are required to keep the learners motivated, something noted by (Tan, 2018). Zoom's moderate effectiveness rating is in line with works claiming that blending synchronous classes encourages in-class participation, interaction, and discussion (Martin et al., 2020). But, there is a risk of learners becoming disengaged due to the passive nature of listening and technological issues, as noted through research (Sobaih et al., 2022). Its benefits for engaging inter-discourse conversations are not as effective due to social factors, for example, internet connectivity and how interactive sessions are. The use of Microsoft Teams had the lowest ratings both in usage and effectiveness which has been commented on in prior research concerning usability problems

(Tariq, 2025; Toleuzhan et al., 2023). Learners discovered it to be more difficult than the other platform's, which supports (Ullah & Usman, 2023) research regarding the construction of educational technologies and their impact on participation and learning outcomes.

Analysis from the interviews provided additional information on the factors influencing learners' interaction with the ICT tools, focusing on ease of use, engagement, and learning styles. Ease of use is one of the most important determinants in the use of ICT tools by learners, as suggested by technology acceptance models (Tzenios, 2022). The respondents reported preferring YouTube the most because it is easy to use, which confirms the findings of (Zakaria et al., 2021) who posited that engaging interfaces increase user participation. On the other hand, Microsoft Teams was viewed as unnecessarily complicated, which confirms the findings that too many features can result in cognitive overload and disengagement (Sweller, 1994; Selwyn, 2016). These findings suggest that design features should focus on ease of use to reduce cognitive load and improve learning outcomes. Engagement surfaced as a key contributor towards learning effectiveness. The preference for Zoom discussions supports constructivist learning theorists' principles of participation (Hansen et al., 2020; Mhlanga, 2023), But some participants indicated that poorly organized live sessions led to participants being passive, which supports research that points to less engagement during the presentation of information in a lecture format (Motorga, 2023).

As the study shows, the use of gamification in digital learning is beneficial because components such as quizzes and leaderboards increase engagement and interest (Ayanwale et al., 2023; Benavot et al., 2022). These results show support for (Bloomberg, 2021) who argued that gamified learning experiences increase students' motivation and knowledge retention. The study emphasizes the importance of accommodating different learning preferences by providing more customizable digital learning tools. The need for more structured environments, for instance, within Google Classroom, corresponds with evidence that organized course content and clear markers of progression aid in motivating learners (Adipat et al., 2021). At the same time, the need for self-paced learning corresponds with self-determination theory which asserts that learners' freedom in the learning process motivates them to engage more. The popularity of YouTube corroborates the findings of (Akintayo et al., 2024) who argued that having access to resources which are not time-restricted allows for personalized learning.

In addition, conventionally organized coursework alongside self-study was preferred by the participants. This supports other studies which claim blended learning approaches are most effective (Benavot et al., 2022; Charles, 2021). These outcomes demonstrate the increasing concern towards gaps in the literature which break the stereotype of low-quality and effortless education. Recognizing that different subjects could require different approaches to learning highlights the need for flexible digital educational aids. These results emphasize the need for educational institutions and designers of the platforms to address a simple structure, internet access, and better intra-active features of learning as central problems to enhance the quality of education and its outcomes. There is a need to investigate the way the features of design specify their use and effectiveness as ICT tools for instruction, especially in regard to digital education for multilingual students. In addition, the improvements in access and infrastructure of technology aimed at eliminating the digital divides contribute to providing unrestricted learning opportunities for all learners.

Conclusion

The findings indicate how ICT tools can transform participation and engagement within the context of lifelong learning by fostering adult education accessibility and flexibility. The organized structure of Google Classroom received positive praise, while YouTube earned the highest marks for self-paced learning effectiveness. Active participation was made possible through Zoom, although interaction varied based on how the sessions were structured, and usability issues arose for Microsoft Teams. Beyond these positive aspects, the greatest barriers for effective digital learning were the digital divide, platform usability, and lack of motivation within passive settings. Results highlight the need for non-linear, highly interactive, and adaptive systems for digital learning. They argue that institutions and developers have to consider user-friendly solutions that employ flexible interaction goals and accommodate diverse learners. Future studies ought to address the creation of new digitally supportive ICT learning frameworks, closing the technological gap, and enhancing ICT use to make lifelong learning more effective and inclusive.

References

Adipat, S., Laksana, K., Busayanon, K., Asawasowan, A., & Adipat, B. (2021). Engaging students in the learning process with game-based learning: The fundamental concepts. *International Journal of Technology in Education*, *4*(3), 542-552.

Ahsan, M. J. (2025). Cultivating a culture of learning: the role of leadership in fostering lifelong development. *The Learning Organization*, *32*(2), 282-306.

Akintayo, O. T., Eden, C. A., Ayeni, O. O., & Onyebuchi, N. C. (2024). Evaluating the impact of educational technology on learning outcomes in the higher education sector: A systematic review. *International Journal of Management & Entrepreneurship Research*, *6*(5), 1395-1422.

Alias, N. F., & Razak, R. A. (2025). Revolutionizing learning in the digital age: A systematic literature review of microlearning strategies. *Interactive Learning Environments*, *33*(1), 1-21.

Ayanwale, M. A., Mosia, P. A., Molefi, R. R., & Shata, L. (2023). Reliability Components of Online Teaching and Learning Tools in Lesotho Higher Education Institutions: A Systematic Review. *Pertanika Journal of Science & Technology*, *31*(1).

Benavot, A., Hoppers, C. O., Lockhart, A. S., & Hinzen, H. (2022). Reimagining adult education and lifelong learning for all: Historical and critical perspectives. *International Review of Education*, *68*(2), 165-194.

Berezi, I. U. (2025). Virtual Learning Environment: Redefining Higher Educational Delivery for Efficiency and Accessibility. *International Journal of Educational Management, Rivers State University.*, *1*(1), 451-467.

Bloomberg, L. D. (2021). *Designing and delivering effective online instruction: How to engage adult learners*. Teachers College Press.

Charles, P. K. (2021). Towards a Paradigm Shift from Andragogy to Heutagogy: Learners' Utilization of Online Resources at the Institute of Adult Education. *Journal of Adult Education in Tanzania*, *23*(1).

Dritsas, E., & Trigka, M. (2025). Methodological and Technological Advancements in E-Learning. *Information*, *16*(1), 56.

Elbaghdadi, Z. (2023). Instructional design and development tools for online adult education: a literature review.

Gichuhi, L. (2025). Teacher Trainees' Perspectives on the Use of Technology for Teaching and Learning in Forced Displacement Contexts. *Journal of Interactive Media in Education*, *2025*(1).

Gm, D., Goudar, R., Kulkarni, A. A., Rathod, V. N., & Hukkeri, G. S. (2024). A digital recommendation system for personalized learning to enhance online education: A review. *IEEE Access*, *12*, 34019-34041.

Hansen, R. J., Talmage, C. A., Thaxton, S. P., & Knopf, R. C. (2020). Enhancing older adult access to lifelong learning institutes through technology-based instruction: A brief report. *Gerontology & geriatrics education*, *41*(3), 342-351.

Makinde, S. O. (2025). Advancing Pedagogical Excellence: Strategies for Enhancing SoTL in Digital Classrooms. In *Enhancing the Scholarship of Teaching and Learning in Online Learning Environments* (pp. 1-20). IGI Global Scientific Publishing.

Mhlanga, D. (2023). Open AI in education, the responsible and ethical use of ChatGPT towards lifelong learning. In *FinTech and artificial intelligence for sustainable development: The role of smart technologies in achieving development goals* (pp. 387-409). Springer.

Motorga, M. E. (2023). Digital transformation in adult education: empowering global understanding and sustainable development. *Revista de Științe ale Educației*, *48*(2), 46-63.

Naseem, O., & MANUU, H. Technological Era and Digital Learning Innovations.

Rawas, S. (2024). ChatGPT: Empowering lifelong learning in the digital age of higher education. *Education and Information Technologies*, *29*(6), 6895-6908.

Roberts, L. N. (2025). Utilising Digital Tools to Enhance Teamwork Among Adult Learners in a Postgraduate Course. In *Developing Effective and High-Performing Teams in Higher Education* (pp. 251-284). IGI Global.

Ruiz-Rojas, L. I., Salvador-Ullauri, L., & Acosta-Vargas, P. (2024). Collaborative working and critical thinking: Adoption of generative artificial intelligence tools in higher education. *Sustainability*, *16*(13), 5367.

Shoufan, A., & Mohamed, F. (2022). YouTube and education: A scoping review. *IEEE Access*, *10*, 125576-125599.

Sobaih, A. E. E., Palla, I. A., & Baquee, A. (2022). Social media use in e-learning amid COVID 19 pandemic: Indian students' perspective. *International journal of environmental research and public health*, *19*(9), 5380.

Tan, S. C. (2018). Technologies for adult and lifelong education. *The palgrave international handbook on adult and lifelong education and learning*, 917-937.

Tariq, M. U. (2025). Empowering Learning Through Networked and Connected Education: Case Studies in Digital Engagement. In *Cases on Enhancing P-16 Student Engagement With Digital Technologies* (pp. 169-198). IGI Global Scientific Publishing.

Toleuzhan, A., Sarzhanova, G., Romanenko, S., Uteubayeva, E., & Karbozova, G. (2023). The Educational Use of YouTube Videos in Communication Fluency Development in English: Digital Learning and Oral Skills in Secondary Education. *International Journal of Education in Mathematics, Science and Technology*, *11*(1), 198-221.

Tzenios, N. (2022). Learner-centered teaching. *International Research Journal of Modernization in Engineering Technology and Science*, *4*(12), 916-919.

Ullah, A., & Usman, M. (2023). Role of libraries in ensuring quality education at higher education institutions: a perspective of Pakistan. *Inverge Journal of Social Sciences*, *2*(4), 13-22.

Vitalis, P. O., Aondover, E. M., Ogunbola, O., Onyejelem, T. E., & Ridwan, M. (2025). Accessing Digital Divide and Implications in Nigeria: The Media Dimension. *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)*, *8*(1), 1-12.

Yeganeh, L. N., Fenty, N. S., Chen, Y., Simpson, A., & Hatami, M. (2025). The Future of Education: A Multi-Layered Metaverse Classroom Model for Immersive and Inclusive Learning. *Future Internet*, *17*(2).

Yeh, H.-C. (2025). The synergy of generative AI and inquiry-based learning: transforming the landscape of English teaching and learning. *Interactive Learning Environments*, *33*(1), 88-102.

Zakaria, M., Ahmad, J. H., Bahari, R., Hasan, S. J., & Zolkaflil, S. (2021). Benefits and challenges of adopting Google Classroom in Malaysian University: Educators' perspectives. *Ilkogretim Online-Elementary Education Online*, *20*(1), 1296-1304.