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E-learning experiences of adults during Covid-19 outbreak: The moderating effect of gender

Olivia Adwoa Tiwaah Frimpong Kwapong
University of Ghana, Accra, Ghana

Abstract

Covid-19 has brought surprises in the educational landscape. Educational institutions had to hurriedly migrate all teaching, learning and assessment activities to online platforms. Such was the case of adult learners who had signed on to the access course for entrance into the University of Ghana. This study sought to find out how the e-learning experiences of adult learners differed across gender as they studied English language, Logic and Mathematics online. From a quantitative analysis of the data, the online experience of students with regard to Mathematics learning did not differ along gender lines. Therefore, the experiences of males and females were similar. Though, there were differences across gender groups regarding Logic and English language experiences, those of Logic experience were much bigger, where males provided overall more positive ratings than females. Specifically, for Logic experience, instructors' show of respect to students, understanding of the learning needs of students and effective communication were rated generally better among males than females. Going forward, Logic instructors should pay equal attention to both groups irrespective of their gender to identify their learning needs and support them accordingly. Furthermore, all the instructors irrespective of their course could continue to improve their delivery of the courses as well as their relationships with the students in order to enhance future experience of the students.

Keywords

e-learning, online learning, adult learners, gender, Covid-19, Ghana, Africa

Corresponding author:
Olivia Adwoa Tiwaah Frimpong Kwapong, University of Ghana, LG 31 Legon, Accra, Ghana.
Email: oatkwapong@ug.edu.gh

Introduction

The Covid-19 disease which the World Health Organization classified in March 2020 as a global pandemic (Smith et al., 2020) has had a massive impact on the provision of formal education. Institutions have had to quickly move their courses unto online platforms for delivery (Chung et al., 2020; Naji et al., 2020). One such case is that of adult learners who were going through an access course in preparation for writing an entrance examination at the University of Ghana. The preparatory courses cover Mathematics, English language and Logic. Studies that cover the academic activities during the outbreak of the Covid-19 Pandemic have covered areas such as challenges or barriers to online learning (Baticulon et al., 2020), perceptions of students (Abbasi et al., 2020; Adnan & Anwar, 2020; Demuyakor, 2020; Shawaqfeh et al., 2020), effects of Covid-19 on e-learning (Mulenga & Marbán, 2020a; Shahzad et al., 2020), effectiveness of online learning during Covid-19 (Bahasoan et al., 2020), gender divides and inequalities (Bacher-Hicks et al., 2020; Blundell et al., 2020; Campos-Castillo, 2020; Malisch et al., 2020) and readiness to transit to online (Chung et al., 2020; Naji et al., 2020). There have not been studies that cover gendered experiences of adult learners who are now preparing to enter the institution of higher learning. Considering the urgency with which the online systems were set up for students, it is prudent to find out how the process impacted on both male and female adult learners as they studied Mathematics, English Language, and Logic and Critical Reasoning.

E-learning is traced to correspondence education (Notten & Nikken, 2016). The World Wide Web, which was invented by Sir Tim Berners-Lee in 1989, has had a tremendous impact on society and created online learning opportunities in a span of 30 years. High-speed internet technology has also enhanced E-learning further (Chung et al., 2020; Simmons, 2020). E-learning is a term used to cover a variety of technology-based learning that uses websites, learning portals, video conferencing, video presentations, tapes, PowerPoint slideshows, YouTube, mobile apps, and thousands of technology driven tools and resources for delivering digital content. Some of the e-platforms or media that were used during the Covid-19 outbreak include online portal, TV School, Microsoft teams, Zoom, Slack, Google Meet, Edu Page, YouTube and Facebook, among others (Basilaia & Kvavadze, 2020; Fansury et al., 2020; Shahzad et al., 2020). Fatima (2020) has noted that with the invention of Zoom, Microsoft Teams, Google Classroom and Moodle, among others, a new model of blended teaching–learning that combines the characteristic features of online learning with face to face interaction is a necessity. This will help reduce the distance between the teacher and the learner that distance education experts have been working hard to achieve over the years (Kwapong, 2010). Fansury et al. (2020) have defined E-learning as a learning process involving digital devices in student learning activities that will be able to provide new learning space and culture so that learning activities can take place anytime and anywhere (pp. 5). E-learning could thus be simply explained as studying in the online environment which is supported by educational technologies. Generally, the preference of

students for e-learning varies. While some are comfortable with e-learning because of the flexibility it offers, others are still committed to the face-to-face mode. Some also prefer a blended mode. In a study by Chung et al. (2020), some of the students involved in the study did do not want to continue with online learning while most of them preferred online learning via pre-recorded lectures uploaded to Google Classroom and YouTube. The sections that follow cover literature on the state of e-learning, the sex and age factor and the teaching of Mathematics and English Language online. The literature review section is followed by the methodology, analysis of field data, discussions and then conclusion.

Literature review

The state of e-learning during Covid-19: Opportunities, challenges and strategies

Covid-19 has created opportunities for academic institutions that were reluctant to go online to make that leap no matter the challenges. Countries have seen larger increases in search intensity (Bacher-Hicks et al., 2020). The combined model of online teaching with the flipped learning during the outbreak of the pandemic helped to improve students' learning, attention and evaluation of courses (Tang et al., 2020). Students have therefore found online sessions to be time saving and helping to improve performance as a result of enhanced utility of time and therefore prefer online learning for subsequent academic years of their studies (Gonzalez et al., 2020; Di Mascio et al., 2020). As Fatima (2020) points out, though the situation initially seemed like a problems galore, students were able to have their lectures and write their assessment papers online. According to Naji et al. (2020) some of the benefits derived from the online learning opportunity in the face of Covid-19 is the flexibility and improved space for active learning and student engagement. In their study of medical students, Baticulon et al. (2020) identified advantages of using online learning in medical education to be improved accessibility of information, ease of standardizing and updating content, cost-effectiveness, accountability, and enhancement of the learning process in which students are encouraged to engage as active learners. The authors observe further that e-learning has even been proven to be equivalent if not superior to traditional methods of curriculum delivery. And much as authors such as Mamun et al. (2020) have concluded that low-income countries are not resourced enough to benefit from e-learning, Baticulon et al. are of the view that e-learning has the potential to address issues of faculty shortage and expand medical educators to improve their efficiency in low- and middle-income countries. Iyengar et al. (2020) have also indicated that Covid-19 has offered unique learning opportunities for the health-care sector.

Several challenges are, however, identified in the adoption and utilization of e-learning in the Covid-19 period. Much as students' emotions can be well communicated and understood in an online environment, participants of the study by

Migueliz Valcarlos et al. (2020) were of the view that Skype or phone is not always conducive for certain emotional, in-depth academic conversations. Morgan (2020) has noted in a study in the United States that the implementation of remote learning by US schools in the face of the Covid-19 outbreak will impact negatively on schools that do not have enough resources to provide learning opportunities for their students and also students who do not have internet access at home. Internet connectivity has posed a huge challenge in teaching and learning in the online environment. It emerged as the number one challenge faced by students in a study in East Malaysia by Chung et al. (2020), followed by the wide range of online learning methods used by faculty, limited broadband data, slow personal laptops and devices, difficulty in focusing on online studies, absence of face-to-face contacts which demotivates students, difficulty in understanding the content and absence of the required technical skills for e-learning. Other challenges include increased faculty workload, resistance from students, technical hitches, poor human interaction and limited resources (Mardiah, 2020; Naji et al., 2020). Mamun et al. (2020) have noted that over 50% of the students they studied did not have access to large screen smart devices such as laptops, desktop computers or tablets for their online studies. Students who were resident in rural communities were faced with limited high-speed Internet and broadband connections. These had implications, not only for their online teaching and learning but assessment as well. According to Demuyakor (2020), Ghanaian students that were studying in China were satisfied with the mass online learning intervention, however the cost of participating in online learning was high. Internet connectivity was also found to be slow for those who lived off campus. A similar observation was made by Adnan and Anwar (2020) in their study in Pakistan when university students were enrolled on compulsory digital and distance learning courses in the wake of Covid-19. Majority of the students were not able to access internet as a result of technical and financial issues. A total absence of face-to-face interactions was also a concern for the students.

Baticulon et al. (2020) have classified the barriers to online learning during this Covid-19 period under five categories to include technological, individual, domestic, institutional and community barriers. The most critical barrier is at the individual level, which is about difficulty in adjusting learning styles. Responsibilities that the adults performed at home also impacted negatively on their e-learning activities. Internet connectivity is very critical in e-learning. The limitations of internet resources, both in terms of network and data packages, can no doubt restrict all students from harnessing the potential of e-learning in all situations, including the outbreak of a pandemic (Fansury et al., 2020).

Researchers have therefore recommended ways of addressing the various challenges in order to make the best out of the e-learning opportunity that Covid-19 presents. According to Abbasi et al. (2020), since the students they studied did not prefer e-teaching over face-to-face teaching during the lockdown, administrators and faculty of universities have to adopt measures that will improve e-teaching for enhancing learning during situations such as the lockdown. Schools have the responsibility of improving the deployment of remote learning platforms to

ensure that students are equitably accessing and engaging in the use of the learning platforms (Bacher-Hicks et al., 2020). Shawaqfeh et al. (2020) have recommended that distance online learning in health professions education has become a necessity, hence the need to take advantage of the rapid development of platforms for e-learning. Universities have to train faculty to enhance their preparedness for e-learning, equip them for effective delivery of e-learning content and also synchronize the e-learning platforms to ensure consistency and familiarity among both faculty and students (Chung et al., 2020). Support from leadership, support for active student-centred learning approaches and peer support are key for successful online learning delivery (Naji et al., 2020). A study by König et al. (2020) on the Covid-19 pandemic and school lockdowns in Germany revealed that ICT tools, digital teacher competence and opportunities for teachers to enhance their digital competence are critical for adapting online teaching situations in the era of a pandemic.

Educational institutions therefore have to strengthen their teaching and learning policies to make them more responsive to the learning needs of the students beyond conventional classrooms (Toquero, 2020). There is also the need to prepare students for e-learning and resource them with vouchers for internet connection (Tang et al., 2020) since they may be willing to use their own smart devices for learning purposes (Sardone, 2019). Governments also have a key role to play in this. According to Mamun et al. (2020), governments in especially low-income brackets should undertake a careful assessment before making online learning mandatory. The commitment of governments, educational institutions and students is crucial for achieving a successful online teaching and learning engagement.

The sex factor in e-learning

There are varied perspectives on e-learning among males and females and adult learners in general. Smith et al. (2020) have indicated that much as boys and men have similar rates of Covid-19 infection to girls and women, boys and men appear to be disproportionately impacted with respect to severity and mortality, including those from marginalized or minority backgrounds. The authors therefore use scholarship about intersections between race and gender; and poverty, social determinants of health, and gender to explain why a health equity lens is important to address the health and social inequities boys and men face during pandemics. This, according to the authors, will contribute to provide future guidance on pandemic responses for society's most vulnerable groups (Smith et al., 2020).

According to Blundell et al. (2020), Covid-19 is bound to create more inequalities in all sectors of the economy including education. They have predicted that the post-Covid-19 world could present opportunities such as more people working from home, more men being engaged in childcare and more focus on important changes of attitudes. According to the authors, much as childcare has been a predominant women's role, the onset of the Covid-19 pandemic has brought about a documented increase in childcare by men. This could possibly contribute to enhanced experiences of childcare among men and thus lead to a change in

social norms and create a balance in childcare that has been difficult to achieve over the years. On the other hand, women could also emerge as key workers and therefore possibly cause a reduction in gender and income inequalities. Alon et al. (2020) have confirmed these observations by indicating that the economic downturn of Covid-19 has implications for gender equality. The authors anticipate that most fathers will have to take primary responsibility for childcare which could erode social norms and bring about equal division of labour in the home. This implies that family women who are studying will have childcare support in the home and therefore be able to find more time and space to focus on their studies. Bacher-Hicks et al.(2020) have observed that the pandemic will widen achievement gaps due to the differing access to internet facilities and engagement with online resources. The promotion of equitable access to online learning could therefore help improve the effectiveness of education policy responses to the Covid-19 pandemic. The study by Grandy and Mavin (2020) explored how informal and socially situated learning and gendered practices impact the experiences of women who are learning to lead and the gendered dynamics that are inherent in women's lived experiences of learning. The authors found that gendered practices are concealed and revealed through informal learning processes. It was found in the study by Chung et al. (2020) that while all the respondents were generally ready for online learning, the females were more ready and satisfied than the males. The female students were also found to have better learning experiences compared to male students. It was found in the study in Malaysian universities by Shahzad et al. (2020) that males and females have different levels of usage of e-learning portals. The authors concluded that female students have a better understanding of the successful use of e-learning portals for content delivery. Male students on the other hand had low concern or understanding of the usage of e-learning portals. These confirm the observation by Tang et al. (2020) that the dominance of males over females in e-learning is no longer valid. The findings counter the idea that technology-related activities have been viewed as a male domain.

These varied gendered differences have implications for online facilitation as well. According to Migueliz Valcarlos et al. (2020) there is the need for a careful consideration of online feminist pedagogy to effectively facilitate online discussions for students. Students have to be directed to unpack the patriarchal system and other sources of oppression so that they can effectively participate in the academic discourse. A study by Malisch et al. (2020) has revealed that Covid-19 has implications for female academics and recommends the need to handle them differently. This is because online teaching has been found to be time consuming for faculty who have heavier teaching loads, larger classes and more student contact hours.

Online teaching of Mathematics and English Language during Covid-19 outbreak

Researchers have looked at how subjects such as Mathematics and English language could be taught online especially during the outbreak of the Covid-19

pandemic. Some of these studies will be discussed in this section of the paper to explore the implications for the research that was undertaken among adult learners in Ghana. According to Jaffe (2020), intelligence is not fixed, so most of us may not be innately talented in all areas of learning, yet we all have the capability of learning anything. Students learn Mathematics better with effective and appropriate technology (Perienen, 2020, pp. 01). Technology has become an essential tool for doing Mathematics in today's world. It can be used in a variety of ways to improve and enhance the learning of Mathematics (Niess, 2006).

Educational technologies can be used to facilitate mathematical problem solving, communication and reasoning. In addition, technologies provide students with opportunities to explore different representations of mathematical ideas and support them to make connections within and outside of mathematics. For instance, calculators are used by adults as they wish, spreadsheets, Geometer's sketchpad and some applets provide students with a wide range of mathematical exploration and sense-making opportunities (Niess, 2006). The outbreak of the Covid-19 pandemic gave opportunities for both faculty and students to leverage on educational technology for online teaching and learning. A study by Tang et al. (2020) on online learning activities of Mathematics teachers of secondary schools in Indonesia during the Covid-19 pandemic found that the impact of the mathematics curriculum barrier is less significant than the students' lack of knowledge and skill in e-learning and access to devices and internet connection.

Almanthari et al. (2020) studied Mathematics online learning activities of prospective teachers when the Zambian Government closed down schools due to the outbreak of the Covid-19 pandemic. The study revealed that a cluster of the students exhibited excellent online learning skills for mathematics in technology-rich environments in which they were forced to study. It was further revealed that online learning in mathematics can offer personalized education for all, maximize the potential of each student, and provide a sense of freedom during self-isolation periods. Online mathematics education is one of the best responses during pandemics and that differentiated mathematics instruction is a key strategy while delivering online lessons. The work of King and Smith (2020) focused on in-service teachers who were taking a graduate level mathematics education course. The authors concluded that feedback from instructors and classmates, in addition to having time for reflection and revision is significant in Mathematics instruction. Mulenga and Marbán (2020b) sought to find out whether Covid-19 is the gateway for digital-learning in mathematics education by exploring some uptakes of social media platforms by prospective secondary school teachers and concluded that digital learning could be a positive response to the closure of schools during the Covid-19 period. The authors recommend that e-learning in mathematics allows students to study at the comfort of their homes provided they have digital devices, access to internet, affordable internet costs and adequate supply of electricity. Such resources will equip them to take the front seats in the mathematics virtual classroom. The e-teaching of Mathematics will also create opportunities for teachers to have a mathematics pedagogical shift to a less formalized or structured method of

teaching that will be entertaining and interesting or exciting compared to the usual rigorous traditional approach. What is critical is for the resources to be uploaded ahead of time so that students can freely access them beforehand. The authors concluded that the adoption of digital learning as a response to Covid-19 would stimulate the growth of digital learning in mathematics, in Zambia and in other countries that had been historically resistant to e-learning.

Recognizing that technology holds pedagogical affordances for addressing low performance in mathematics education, Perienen (2020) investigated the factors that significantly contribute to technology usage by Mathematics teachers and confirmed that Mathematics teachers use technology regularly. Most of them channel their computer skills into their teaching-related activities. Meanwhile some of the teachers were hesitant and anxious to engage in innovative computer-mediated teaching and break away from the traditional teaching practices. Perienen however recommends that e-assessment or e-tests from computer-generated questions should be utilized to be administered at any time for students to obtain their grades instantly to serve as a motivation for both teachers and students.

According to Irfan et al. (2020), when universities in Indonesia started online learning to replace classroom lectures in March 2020 as a measure for reducing the transmission of the Covid-19 outbreak in Indonesia, it was assumed that it will be difficult in mathematics education. Hence a study was undertaken among lecturers to explore the possible obstacles in online teaching of Mathematics in Higher Education. The authors found that the Mathematics lecturers were using learning management systems such as google class and Edmodo to teach, while supporting it with video conferencing via Zoom and Skype meetings. Some of the challenges that the authors found from the study include the writing of mathematical symbols in equations and programming languages, limited capacity of the learning management platforms, and unavailable multimedia software to support online learning. The lecturers were also found to be limited in video editing or the use of animation software besides the preparation of PowerPoint and text presentations.

Studies by King and Smith (2020), Perienen (2020), Almanthari et al. (2020), Tang et al. (2020), Mulenga and Marbán (2020b), and Irfan et al. (2020) on teaching Mathematics online during the outbreak of the Covid-19 pandemic have shown that it is a possibility. Assessment online was also found to be timelier (Perienen, 2020). The issues that have to be dealt with cover teachers' capacity to teach online, students' capacity to study online, availability of e-learning resources such as high-speed affordable Internet facilities, user-friendly learning management platforms, laptops, tablets and other smart electronic devices.

The next section of the literature review looks at English Language which compared to Mathematics is a less technical subject in terms of the use of unique symbols and programming language for online teaching and learning.

Technology became a part of English Language Teaching–Learning during the 1900s (Fatima, 2020). Wulandari, Surtikanti and Agung (2020) studied difficulties of learning English Language as a foreign language and found that interest and

motivation of students is a factor. There could be boredom if the approaches are not varied. The use of learning media by teachers also has implications for the teaching and learning engagement. Basilaia and Kvavadze (2020) have noted that in English language teaching and learning, virtual distance learning environments allow students to create a world that encompasses anything they can dream up. Interaction, simulation and collaboration contribute to enable learning in the interactive environment in English language education.

A study by Agung et al. (2020) on students of English Language Education in Indonesia sought to find out how they perceived their online classroom experiences. Issues that emerged were not about possibility of online pedagogy in English Language but sustainable internet connection, access to teaching media and having tools or gadgets that are compatible to access the media. The authors therefore recommended the need for user-friendly platforms especially for students who reside in remote areas that do not have stable internet connectivity and other support systems.

Krishnapatria (2020) undertook a study to find out the perception of students on e-learning implementation during Covid-19 in two English language subjects and found that 100% of students participated in the e-learning, with 56% expressing satisfaction with the implementation of e-learning. The author further observed that the e-learning in English language offered flexibility and the opportunity for students to have control over their study path and pace. The study by Fansury et al. (2020) on teaching English Language during Covid-19 pandemic concluded that using digital content in teaching English is helpful for students to understand their study materials. The e-learning approach also eased the learning process and enabled the direct integration of various applications such as WhatsApp groups, Zoom and Google Meet to help avoid physical contact, and enhanced student motivation to learn as a result of the way the content was designed and presented.

The work of Fatima (2020) on teaching of English Language during Covid-19 has noted that language teaching has gone through a dramatic change that impacted on the curriculum, pedagogy, evaluation of students' performance while still trying to maintain quality of teaching and sustaining students' enthusiasm at the same time. The author admits that, much as the situation appeared to be problematic at the onset, students and faculty were able to sail through. This according to Fatima gives an indication that, if it is well implemented with some room for flexibility for the learner and the instructor, teaching and learning of English Language could prove to be successful.

Mardiah (2020) also studied the teaching of English online during the outbreak of Covid-19 and observed that Web pages can help lecturers to teach English by grouping the Web pages in domains such as vocabulary, grammar, phonetics and the four language skills of speaking, listening, reading and writing. Lecturers will then access textbooks, English video or other resources and share the links with students for online discussions and assessments. The author finds e-learning to be an interesting experience for students. Syahrin and Salih (2020) investigated the

online learning experiences of English language higher learning institution during the Covid-19 and found that the preferred learning styles of most of the students were reflected in the technologies that were used in the online classroom. The receptive skill-based pedagogy of listening and reading was acquired. But the absence of students' productive skills of speaking and writing was a concern. The authors therefore recommended the need to consider the different learning styles of the students when teaching with educational technologies. This will contribute to effective design and delivery of the online course to help achieve the learning objectives and create a positive online classroom experience.

The studies by Fatima (2020), Wulandari et al. (2020), Basilaia and Kvavadze (2020), Agung et al. (2020), Krishnapatria (2020), Fansury et al. (2020), Mardiah (2020) and Syahrin and Salih (2020) have proved the possibility of teaching English language online during challenging times such as during the outbreak of Covid-19. Similar to observations made on the online teaching of Mathematics, there is no problem with the capacity of the educational technologies. The issues that both instructors and students faced centred around the available IT infrastructure and the human factor, thus the capacity of the human resource such as availability of reliable internet connectivity, capacity of instruction to design user-friendly course websites that meet the varied learning styles of students and attract and motivate them to study online. The e-learning system should be able to support both the receptive and productive skill-based pedagogy of listening, reading, speaking and writing. This study will explore how the issues raised will reflect the situation of adult learners who had to hurriedly adjust themselves to study Mathematics, Logic and English Language online during the Covid-19 outbreak in Ghana.

Methods

This study obtained feedback from adult learners on their learning experience about the university's access course. The study took place in 2020 with a total of 752 participants. A questionnaire for this study was designed to assess learners' perception of learning outcomes in an online learning environment. The instrument was designed in google forms and administered using the university's online portal from 13 July to 31 July 2020. Students provided responses to the 12 items using a Likert scale coded as, 1 = strongly disagree and 5 = strongly agree. At the close of portal, a total of 754 students out of an estimated 1729 applicants had responded to the survey, representing 43.6%.

To qualify to respond to the questionnaire, each respondent had to first consent to answering the questions before proceeding to the actual questions. That is, once the applicant opened the form, a detailed description of the study was provided to allow them opportunity to agree to continue to the questions or not. As much as possible, questions were detached from each other to allow a respondent to decide whether to answer a particular question or not.

As a way to guarantee confidentiality, the data did not pick any personal identifiers. All responses were anonymized during the data analysis.

Table 1. Scales of variables in the model-online learning experience.

Concept	Items
Mathematics Instructor	My Mathematics instructors treated me with respect
	My Mathematics instructors understood my learning needs
	My Mathematics instructors communicated the subject content effectively
	My Mathematics instructors made the subject as interesting as possible
English Instructors	My English instructors treated me with respect
	My English instructors understood my learning needs
	My English instructors communicated the subject content effectively
	My English instructors made the subject as interesting as possible
Logic Instructors	My Logic instructors treated me with respect
	My Logic instructors understood my learning needs
	My Logic instructors communicated the subject content effectively
	My Logic instructors made the subject as interesting as possible

Scale ranges 1–5, where 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree.

Data were analyzed using IBM SPSS version 23.0 and structural equation modelling software of Amos version 23. Main statistical procedures utilized were exploratory factor analysis, confirmatory factor analysis (CFA) and structural equation modelling. The scale of variables used is presented in Table 1.

The background information of the students who provided feedback on their experience is presented in Table 2. Almost an even number of males and females were surveyed with about 50.7% females and 49.3% males. Also, half (50.4%) of the participants in the survey were less than 30 years, about 41.9% of them were between 30 and 39 years and the remaining (7.7%) of them were 40 years and above. Three in four (74.9%) participants had SHS/A level/post-secondary. About 16.6% of them had Diplomas/HND from a tertiary institution, and the rest had Vocational/Technical (3.7%) and basic education (4.8%). More than half (52.3%) of the participants were in full-time employment, about 15.8% were in part-time employment, about 22.2% of them were self-employed and the remaining were unemployed (9.7%). Two in three (66.4%) participants were single, about 31.3% of them were married and the rest were divorced/separated/widowed (2.3%). Two in five (42.4%) were earning less than GHC1000 per month, about 29.3% of them were earning between GHC1000 and GHC2000 whereas about 6.8% of them were earning above GHC2000. The rest (21.5%) did not disclose their income information or had none.

Analysis and results

Descriptive statistics

The descriptive statistics of the individual items of student experience before validation are presented in Table 3. Regarding treating students

Table 2. Background information of respondents.

Variable	Frequency	Per cent
Gender		
Male	371	49.3
Female	381	50.7
Age		
<30 years	379	50.4
30–39 years	315	41.9
40 years and above	58	7.7
Educational level		
Basic (Primary/JHS)	36	4.8
Voc/Tech	28	3.7
SHS/A'Level	563	74.9
Tertiary (Diploma/HND)/Professional	125	16.6
Employment status		
Full-time employment	393	52.3
Part-time employment	119	15.8
Self-employed	167	22.2
Unemployed	73	9.7
Marital status		
Single	500	66.4
Married	235	31.3
Divorced/Widowed/Separated	17	2.3
Income group		
<GHC1000	319	42.4
GHC1000–GHC2000	220	29.3
>GHC2000	51	6.8
Nonresponse	162	21.5
Total	**752**	**100.0**

with respect, the respondents agreed that they are treated with respect by Mathematics, English and Logic Instructors. Regarding subject content communication, the students agreed that that instructors communicated subject content effectively in all three subjects. Regarding making subject interesting, the students agreed that all the three subjects were made as interesting as possible. Regarding understanding of learning needs, the students agreed that English instructors understood their learning needs. In the case of Mathematics, the rating of males (mean = 3.52) was significantly higher than that of females (mean = 3.39). Also, for Logic, the ratings of males (mean- = 3.60) is significantly higher than that of females (3.41). In all the 12 variables assessing student experience, the average of the ratings by the male students was higher than that of the females.

Table 3. Descriptive statistics of initial items.

	All (n = 752)		Male (n = 371)		Female	
Student experience indicator	Mean	S.D	Mean	S.D	Mean	S.D
My Mathematics instructors treated me with respect	3.93	0.78	3.98	0.79	3.87	0.77
My Mathematics instructors understood my learning needs	3.45	0.90	3.52	0.87	3.39	0.92
My Mathematics instructors communicated the subject content effectively	3.63	0.86	3.68	0.84	3.57	0.88
My Mathematics instructors made the subject as interesting as possible	3.56	0.92	3.57	0.94	3.54	0.90
My English instructors treated me with respect	4.01	0.77	4.06	0.77	3.95	0.77
My English instructors understood my learning needs	3.66	0.82	3.73	0.81	3.60	0.83
My English instructors communicated the subject content effectively	3.87	0.81	3.92	0.79	3.82	0.82
My English instructors made the subject as interesting as possible	3.84	0.86	3.88	0.82	3.81	0.89
My Logic instructors treated me with respect	4.00	0.69	4.08	0.63	3.93	0.74
My Logic instructors understood my learning needs	3.50	0.87	3.60	0.86	3.41	0.87
My Logic instructors communicated the subject content effectively	3.73	0.81	3.81	0.78	3.65	0.82
My Logic instructors made the subject as interesting as possible	3.62	0.89	3.66	0.88	3.59	0.90

Confirmatory factor analysis

The 12 items under Mathematics, English and Logic experience were validated through a process of CFA using IBM AMOS version 23. CFA involves the assessment of mode fit indices, and convergent and discriminant validity of the construct measures (Hair et al., 2016).

The overall model fit of the measurement model was adequate as shown in Table 4. The root mean square error of approximation value was approximately 0.046 which is below the maximum threshold of 0.08 showing excellent fit (Hu & Bentler, 1999). The Adjusted Goodness-of-fit Index (AGFI) of 0.904 exceeds the recommended minimum threshold of 0.8, indicating excellent fit. All the other indices (Incremental Fit Index (IFI), Tucker-Lewis index (TLI), and Comparative Fit Index (CFI)) exceeded the recommended minimum threshold of 0.9 (Kline, 1998).

Table 4. Results of the measurement model tests.

	Absolute fit indices			Noncentrality-based indices		Relative Fit indices	
Model	χ^2	Model AIC	AGFI	RMSEA	CFI	TLI	IFI
Measurement model	267.140	337.140	0.904	0.046	0.938	0.905	0.939
Recommended value			$\geq$0.80	$\leq$0.08	>0.90	>0.90	>0.90

AGFI: Adjusted Goodness-of-fit Index; AIC: Akaike Information Criterion; CFI: Comparative Fit Index; IFI: Incremental Fit Index; RMSEA: Root Mean Square Error of Approximation; TLI: Tucker–Lewis index; χ^2: Chi-Square.

Table 5. Standardized factor loadings, reliability and convergent validity.

Constructs	Loading	α	CR	AVE
Mathematics experience				
math1	0.32	0.735	0.736	0.432
math2	0.64			
math3	0.79			
math4	0.78			
English experience				
eng1	0.46	0.767	0.765	0.459
eng2	0.63			
eng3	0.77			
eng4	0.81			
Logic experience				
log1	0.48	0.802	0.801	0.510
log2	0.72			
log3	0.81			
log4	0.80			

The results of Cronbach's alphas, composite reliabilities and average variance extracted (AVE) estimates are presented in Table 5. All the three constructs meet the minimum Cronbach's alphas of 0.7 (Peterson, 1994). Also, all composite reliabilities are higher than 0.7 (Byrne, 2013; Hair et al., 2016). Though, Logic experience had an AVE value above the minimum threshold of 0.5, those of Mathematics and English experience had AVEs below 0.5. This notwithstanding, all three constructs demonstrate adequate convergent validity since the composite reliabilities are all above 0.7 and the model fit indices are excellent (Borsboom et al., 2004; Fornell & Larcker, 1981).

Table 6. Discriminant validity (square root of AVEs in diagonal-bold)-Fornell–Larcker criterion.

Constructs	1	2	3
1. Mathematics experience	**0.657**		
2. English experience	0.498	**0.677**	
3. Logic experience	0.510	0.621	**0.714**

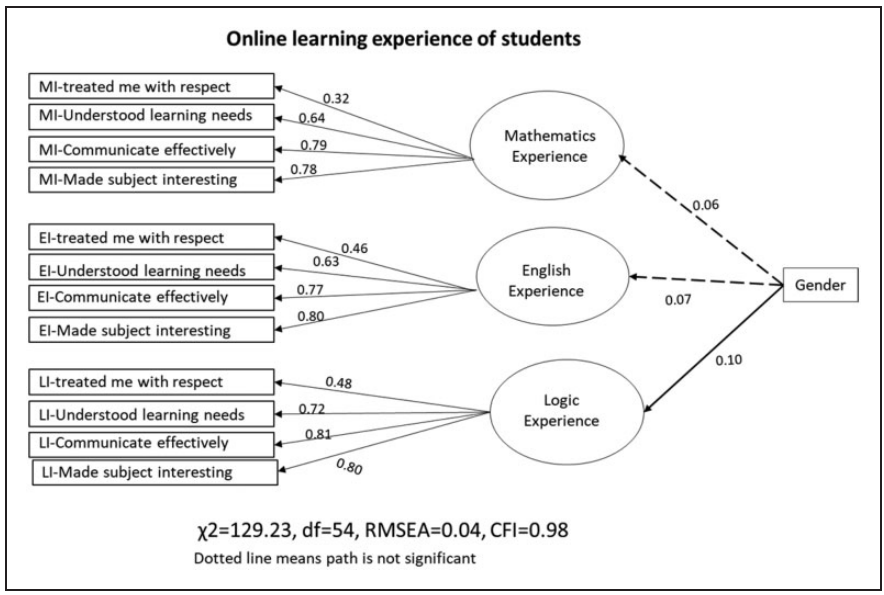

Figure 1. SEM results – Online learning experience of students showing regression weights.
Note: Gender dummy (Female = 0, Male = 1).
EI: English instructors; LI: logic instructors; MI: Mathematics instructors.

From Table 6, discriminant validity is met by the fact that the square root of the AVEs estimates are all higher than the values of the inter-construct correlations (Fornell & Larcker, 1981; Hair et al., 2016).

Online learning experience of males and females

The structural model showing the effects of gender on student experience (Mathematics, English and Logic) is shown in Figure 1 and Table 7. Prior to analyzing the data, the gender variable was converted into dummy variables, where female = 0, and male = 1. The structural model showed excellent fit indices ($\chi^2 = 129.23$, df = 54, RMSEA = 0.04, CFI = 0.98). The results showed that male and female students did not differ significantly with regard to their overall experience

Table 7. Effect of gender on student experience.

Path			Effect	(Boot) t-value	p
Gender	→	Mathematics experience	0.064	1.580	0.114
Gender	→	English experience	0.072	1.787	0.074+
Gender	→	Logic experience	0.104	2.611	0.009**

Gender dummy (Female = 0, Male = 1); **$p < 0.01$; +$p < 0.10$ (two-tail test).
Model fit indices: Chi-square = 129.23, df = 54, RMSEA = 0.04, AGFI = 0.96, CFI = 0.98.
AGFI: Adjusted Goodness-of-fit Index; CFI: Comparative Fit Index; RMSEA: Root Mean Square Error of Approximation.

of Mathematics; however, the overall experience of males about Logic ($p < 0.01$) and English language ($p < 0.10$) were significantly better than those of females.

MIMIC effect of gender on student experience

The authors delved further into the individual variables of student experience to examine if the experience differed along gender lines by using multiple indicator multiple cause (MIMIC) modelling (Posey et al., 2015; Zhu and Aryadoust, 2019). The MIMIC modelling was used to assess differential item functioning (DIF) (Brown, 2015, Woods, 2009). The MIMIC modelling was conducted by testing the effect of gender on each of the 12 items while controlling for the main latent variables. The results are presented in Table 8. All the 12 models had excellent fit indices.

In the case of both Mathematics and English language, there were no DIF at both construct level and individual item level. The implication of this result is that the experience of both male and female students in Mathematics and English language is similar.

As revealed earlier, there was a significant difference between males and females, with regard to the overall Logic experience, with males rating their overall experience as better. There was also evidence of DIF with respect to the statement 'LI-made subject interesting', after controlling for the construct-logic experience. That is, there was gender difference with respect to the responses obtained for 'LI-made subject interesting'. Specifically, males were significantly less likely to agree to the fact that Logic instructors made the subject interesting than females. The implication of this result is that in three of the four items measuring Logic experience, males marginally rated their experience better than females, whereas in the case of making subject interesting, females significantly rated their experience better than males.

Limitation of the study and suggestions for future direction

The study could have gathered responses from the tutors to explore how they also perceived the participation of the learners. The capacity of the tutors to manage adult learners could have also impacted on their output. The cultural orientation which makes males feel superior and therefore expect to be highly respected and

Table 8. MIMIC effect of gender on student experience.

Path			Effect	t-value	p	Fit indices χ^2	RMSEA	CFI
Mathematics experience								
Gender	→	MI-treated me with respect	0.017	0.565	0.572	128.905	0.044	0.979
Gender	→	MI-Understood learning needs	0.018	0.614	0.539	128.848	0.044	0.979
Gender	→	MI-Communicate effectively	0.03	1.023	0.306	128.186	0.043	0.979
Gender	→	MI-Made subject interesting	–0.051	–1.754	0.079	126.14	0.043	0.980
English experience								
Gender	→	EI-treated me with respect	0.009	0.288	0.774	129.14	0.044	0.979
Gender	→	EI-Understood learning needs	0.021	0.740	0.460	128.678	0.044	0.979
Gender	→	EI-Communicate effectively	0.013	0.441	0.659	129.029	0.044	0.979
Gender	→	EI-Made subject interesting	–0.033	–1.141	0.254	127.92	0.043	0.979
Logic experience								
Gender	→	LI-treated me with respect	0.04	1.411	0.158	127.244	0.043	0.980
Gender	→	LI-Understood learning needs	0.021	0.771	0.441	128.634	0.044	0.979
Gender	→	LI-Communicate effectively	0.025	0.924	0.355	128.378	0.044	0.979
Gender	→	LI-Made subject interesting	–0.066	–2.430	0.015*	123.312	0.042	0.981

Sex dummy (Female = 0, Male = 1).
Path results obtained after controlling for the latent variables: Mathematics experience, English experience and Logic experience.
*$p < 0.05$ (two-tail test).
CFI: Comparative Fit Index; EI: English instructors; LI: logic instructors; MI: Mathematics instructors; RMSEA: Root Mean Square Error of Approximation.

recognized was also not assessed in the study. Further studies could therefore focus on the perspectives of the teachers and how that could inform the experiences of the learners, their capacity to manage adult learners, especially in an online environment, and the influence of the cultural context in adult learning enterprises could be further investigated.

Conclusion

The implication of the above results is that the online experience of students with regard to Mathematics learning did not differ along gender lines. Therefore, the experiences of males and females were similar. On the other hand, for both Logic and English language learning experience, males provided overall more positive ratings than females. With regard to individual variables under Logic experience, females were more satisfied than males about the fact that the instructors made the subject interesting, whereas in all the other three categories such as Logic instructors' show of respect to students, understanding of the learning needs of students, and effective communication, males appeared better satisfied than females. Though, there were differences across gender groups regarding Logic and

English language experiences, that of Logic experience was much bigger. The possible reasons for the huge gap in the experience of males and females in Logic rather than Mathematics and English language could be because Logic course is relatively new to the students unlike Mathematics and English language where students had prior experience in the second cycle institutions.

The study therefore recommends that going forward Logic and English instructors should pay equal attention to both groups irrespective of their gender to identify their learning needs and support them to come up. Also, Mathematics instructors could continue to pay equal attention to both genders in the delivery of the courses to maintain equitable Mathematics experience across both groups. All the instructors irrespective of their course could continue to improve their delivery of the courses as well as their relationships with the students in order to enhance future experience of the students. Culturally, males expect to be highly respected and recognized, hence instructors have to take note and treat them cautiously in their engagements. Instructors of adult learners have to be trained on methods of teaching adults and adult learning principles so that they can be more professional in handling adult learners. There should however be a policy direction to introduce students to logical reasoning and critical thinking at early stages of their formal studies to enhance their skills and personal development in that aspect as well.

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ORCID iD

Olivia Adwoa Tiwaah Frimpong Kwapong https://orcid.org/0000-0002-7988-5782

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