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# The Impact of Online Learning on the Learning Outcomes and Performance of First- Generation College Students in a Ghanaian University

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November 2023

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Suggested citation:

Laryea, E.A., Agbodjah, S., and Annoh W.O., (2023). *The Impact of Online Learning on the Learning Outcomes and Performance of First-Generation College Students in a Ghanaian University*. Mastercard Foundation e-Learning Initiative Working Paper Series 1.0.

<https://doi.org/10.14507/MCF-eLi.117>

This working paper was produced through a Small Research Grant program under the Mastercard Foundation e-Learning Initiative. The e-Learning Initiative aims to support institutions in the Scholars Program network to develop capabilities and resilience to deliver high-quality and inclusive e-Learning and related supports so as to enable all students, including those who face additional barriers, to successfully pursue their studies from anywhere.

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## Acknowledgments

The research team is grateful to Joshua Larney for his dedication and diligence in supporting the team. We are also grateful to the provost for continuous guidance on how we can improve as scholars and the Professor Adei Studio for Research Excellence in collecting the data needed to conduct this study. Finally, and most importantly to the *Mastercard Foundation e-Learning Initiative* for the grant award that made this study possible.

### **Abstract**

The social restrictions imposed by the COVID-19 pandemic made it imperative for educational institutions, especially higher education institutions (HEIs), to move all operations, including teaching and learning, online or halt them temporarily. The sudden move online and the accompanying challenges impacted different student populations differently. Among the student populations most likely to be affected were first-generation college students (FGCS). FGCS are usually from low-income families and face social, economic, and cultural barriers as they navigate college. These challenges were compounded by the move online as FGCS are on record to have faced financial hardships during the pandemic, exacerbated by the loss of on or off-campus jobs and an increase in the general cost of living. While the socio-economic environment within which learning takes place has been found to affect the learning performance of students in general significantly, there is very little evidence to help us understand the channels through which online learning affects the academic performance and learning outcomes of this unique group. This study sought to understand the effect of the move from face-to-face learning to online learning during the pandemic on the academic performance and achievement of learning outcomes of FGCS given their socio-economic backgrounds. Data for the study was collected through online surveys and focus group discussions. The survey data were analysed using regression analysis, while focus group transcripts were analysed using thematic analysis. The results of a *t*-test also showed no significant difference in the academic performance of FGCS and non-FGCS when their pre- and post-pandemic cumulative grade point averages (CGPA) were compared. However, the study also finds that cognitive presence and instructor presence significantly influenced the learning outcomes and performance of FGCS with the move online.

## Project Description

### A. Project Background

Like many other aspects of daily life, COVID-19 has unquestionably had a substantial impact on students, instructors, and educational institutions everywhere (Mailizar et al, 2020). The pandemic compelled schools, colleges, and institutions all over the world to close their campuses to enable students, staff and faculty members to follow social distance practises (Toquero, 2020). However, a seamless transition from a traditional educational environment to a remote and virtual learning environment could not have been achieved overnight. Several challenges accompanied this unavoidable need for change (Crawford, Butler-Henderson, Rudolph, & Glowatz, 2020). With very limited information on when the pandemic can be fully contained, educational institutions worldwide resorted to technological resources at their disposal to offer online learning materials in synchronous and/or asynchronous formats to students studying all academic programs (Kaur, 2020).

While the shift to online learning gave some categories of students the opportunity to complete their education, it also opened up new insights into how a student's background affected their educational achievement. Most educational scholars posit academic achievement is greatly influenced by a student's upbringing and social background, and according to Wei et al. (2019), student backgrounds, school resources, and local contexts account for 60% of the difference in students' performance. Other researchers have investigated how students' socioeconomic status (including their parents' work, education, and income) affects their performance (Brese & Mirazchiyski, 2013; Okioga, 2013).

One important socio-economic characteristic of student background that has received some attention in the academic achievement literature in recent times is the educational background of students' parents. This strand of literature highlights the need to pay attention to scholars whose parents did not attend college or similar tertiary level education: first generation college students (FGCS; Assari, 2019). The life experiences of FGCS students tend to put them behind the curve in terms of college readiness when compared to continuing-generation students, making them more likely to fall through institutional cracks. Only 27% of FGCS graduate after four years (Whitley et al., 2018). The abrupt changes to learning in higher education institutions necessitated by the pandemic may have caused some levels of uncertainty in FGCS, especially those who had to return to multigenerational homes with limited amenities to enhance their academic experience (e.g.: consistent internet access or the availability of laptops and other equipment for loan; Fischer et al., 2020). Additionally, inequities

faced by historically marginalized communities that also intersect with FGCS, such as those based on race and ethnicity, socioeconomic status, gender identity, physical ability, and geographical areas (such as rural and urban communities), have been exposed by the digital divide, which were noticeably exacerbated during the pandemic (Pew Research Centre, 2020).

## **B. Problem Statement**

While the move online provided an opportunity for continued access to education for some, it provided new perspectives on how student background affected the attainment of educational goals. Educational researchers have explored how different student backgrounds influence academic achievement. Wei et al. (2019) found out that 60% of the variation in student performance was accounted for by availability of resources in the schools, student background, and neighbourhood environments. Several other scholars have studied the effect of students' socioeconomic background (education, income, and occupation of parents) on their performance (Brese and Mirazchiyski, 2013; Okioga, 2013).

An aspect of socioeconomic status that significantly affects student performance is parents' educational background (Assari, 2019). Parents' educational background and attainment tend to moderate how they relate to their children while in school. According to the literature, this affects their ability to empathise with emotional and psychological needs of their wards, provide support needed to complete academic tasks and appreciate the financial and career-related support students require. Assari (2019) further describes a strong positive relationship between parental educational attainment and the performance of students.

In examining the relationship between parental educational attainment and student performance, scholars have often focused on a unique group of students whose parents or siblings did not attain a college degree, including FGCSs (Canning et al., 2020; Covarrubias & Fryberg, 2015; Townsend & Stephens, 2021). This interest is fuelled by the unique experiences and struggles of FGCSs. Covarrubias and Fryberg (2015) highlight some of the struggles that FGCSs face, including feelings of guilt and stress associated with being the first person to have such an opportunity and the stress of combining responsibilities both at home and school. Deng and Yang (2021) observed that FGCS are usually from low-income families and face social, economic, and cultural barriers as they navigate their way through college.

Online learning is essentially learning which occurs remotely with the mediation of technology (Benson, 2002; Carliner, 2004; Conrad, 2002). The design of online learning environments can have considerable influence on learning outcomes (Bower, 2019; Gonzalez et al., 2020). Additionally, factors such as access to technological devices, technological know-

how, and time management may significantly influence the online learning environment (Agormeda et al., 2020; Joostin & Cusatis, 2020). With the challenges faced by the FGCSs highlighted in this section, it is not far-fetched to argue that at the peak of the pandemic FGCS lacked the economic power needed to acquire these technological gadgets and infrastructure needed for online learning. Additionally, the home environment they found themselves in might also not be socially and mentally conducive for online learning, making it difficult for them to meet the pre-requisites identified for effective online learning. These challenges were exacerbated by the economic, social and mental health-related challenges that the COVID-19 pandemic brought on. According to Soria et al. (2021), FGCSs faced financial hardships during the pandemic, exacerbated by the loss of on or off-campus jobs, increase in the general cost of living, and the rapid transition to technology for learning. Consequently, Soria et al. (2021) described FGCS as “twice as worried” about paying tuition fees as compared to their continuing-generation counterparts. Further, they are more likely to live in abusive environments and face food and housing insecurity, resulting in higher rates of mental health disorders (Soria et al., 2021). Consequently, the sudden shift to online learning in response to the pandemic may have adversely impacted the learning outcomes and performances of FGCS.

In spite of this, there are no studies focusing on the effect of online learning on the performance of FGCS, especially in the African context, or research to understand the factors that determine the academic success of FGCS's in an online learning environment. Authors have either focused on the general impact of the pandemic on FGCSs (Soria et al, 2021; Spengen, 2013), or the effect of online learning on the learning performance and outcomes of students in general (Agormeda et al, 2020). This makes it imperative to investigate the impact of online learning, necessitated by the COVID-19 pandemic on the academic performance of FGCS. This study has context specific relevance and will fill this gap to help higher education institutions (HEIs) put in place measures that meet the needs of FGCS better and help them maximise the benefits of online learning.

### **C. Context and Rationale**

The socio-economic background of FGCS makes it imperative to study and understand FGCS in the African context. Africa is identified by the World Bank as the single world region with the highest proportion of poor people in the world. This has implications for FGCS from poor backgrounds, especially given the adverse economic hardships as a result of the COVID-19 pandemic.

Additionally, education has a potential to turn around the economic challenges we face as a continent, understanding the characteristics of these scholars and how they learn could be useful in designing instructions and learning interventions to get African students to learn effectively and eventually make the needed contributions to turn the fortunes of Africa around. The African Union Agenda 2063 identifies education as one of the critical solutions for a developed Africa and in doing this, we must not leave anyone behind.

#### **D. Research Questions**

The study seeks to answer the following research questions:

- a. What factors affect the online learning performance of first-generation college students?
- b. What factors affect the online learning outcomes of first-generation college students?
- c. Did the move online lead to a significant difference between the learning performance of FGCS and non-FGCS?

### **Literature Review and Theoretical/Conceptual Framework**

#### **E. Theoretical Underpinnings**

The study is anchored on three theories: the connectivism theory, the community of inquiry theory, and the social capital theory.

##### ***The Connectivism Theory***

The connectivism theory argues that knowledge creation occurs within a network and describes knowledge as a flow through a network of human and nonhuman nodes (Siemens, 2017). Essentially, networks are made of nodes that connect with other nodes of information to construct knowledge. The nodes include individuals, groups, systems, fields, ideas, resources, or communities. This theory therefore advocates for collaboration and exchange of viewpoints and perspectives between people to make sense of information.

Given that in an online learning environment, FGCS relate more with parents, guardians, and siblings without a college degree as opposed to their peers who can rely on parents, guardians and siblings who have college degrees for support, what role do family structures, and their immediate environment at home play as nodes in their learning network during the knowledge creation process? What viewpoints and perspectives do the individuals, structures



and communities in an FGCS's environment contribute to their learning as compared to their non-FGCS colleagues?

### ***The Community of Inquiry (Col) Theory***

Similarly, the Col theory suggests that learning occurs through the overlap of three main presences (i.e., social, cognitive and teaching presences; Garrison, 2016; Garrison & Akyol, 2013). Social presence refers to the projection of an individual's personality to identify with, communicate with others and build a relationship that allows for sharing of information. The cognitive presence is the ability of the learner to reflect on and make meaning of their experiences while the teaching presence refers to the design and implementation of the cognitive and the social presences for the realization of the intended learning outcomes. In connection with the present study, the family background as well the individuals' own characteristics serve as instrumental factors in determining the individuals' success in an online learning environment. Thus, how does the FGCS background affect their ability to communicate with others and make connections useful for knowledge creation and learning?

### ***The Social Capital Theory***

Social capital is founded on connections that make it easier to access resources. Students who know more college-educated people are likely to have more social capital connected to college and, as a result, have an edge in their academic careers (Nichols & Islas, 2016). FGCS have limited access to these social networks, which pass on crucial information on how to succeed in higher education settings. As a result, they have "inadequate college-related cultural capital" (Ward et al., 2012, p. 106). Parents are crucial in supplying different forms of capital, according to studies, but other family members, friends, and mentors also play a vital role in this process (Nichols & Islas, 2016).

The theories discussed above served as a guiding framework in designing the study, especially research instruments meant to collect data to answer the research questions.

## **F. Review of Related Studies**

### ***Conceptualising First-Generation College Students (FGCS)***

The term "First-Generation College Student" is defined differently by several organizations, frequently varying in the extent of exposure to postsecondary education (e.g., enrolled, attended, or completed) as experienced by various combinations of parent/guardian arrangements (e.g., highest extent of exposure for one parent/guardian or both

parents/guardians), according to ACT (2013). (p. 17). Studies conducted have used several defining characteristics in determining one's FGCS status which may depend on whether one or both parents did not attend college or graduate from it, whether one parent (for example, the mother) did so, or whether both parents did not. In early research, the most prevalent indicator of FGCS status was the absence of any postsecondary attendance by either parent (Gardner & Holley, 2011; Moschetti & Hudley, 2015). Most studies conducted more recently define first-generation status as having one or both parents who did not complete college (Dika & D'Amico, 2016; Toutkoushian, May-Trifiletti, & Clayton, 2021). The present study aligns with scholars who define first generation college students as a student whose parents did not attend or complete college.

### ***Experiences of First-Generation College Students***

In terms of on-campus experiences, FGCSs differ from their non-FGCS peers because they are more likely to enroll part-time and less likely to engage in high-impact activities linked to college achievement (Allison, 2015; Balliro, 2020; Borrego, 2022; Toutkoushian et al., 2021). FGCS are frequently non-traditional in that they are typically older (over 24), female, and from underrepresented groups. Additionally, they typically commute to university from areas highly populated with lower socioeconomic groups, work part-time jobs, are financially independent, have family responsibilities, and are employed (Duke-Benfield, 2015). These students most often live with their families and travel to school (Engle, 2007). The majority of FGCS students in Western nations are people of color (Ishitani, 2006; Pascarella & Terenzini, 2005; Soria & Gorny, 2012). According to Van Zyl (2010) and Siyengo (2015), African students make up the bulk of FGCS.

FGCSs are less likely to see themselves as students because they typically come from backgrounds that do not adequately prepare them for post-secondary education (Bryan & Simmons, 2009; Tierney & Hagedorn, 2002). As a result, they must prioritize their respective personas once they get to campus because they live in multiple identity spheres at the same time (Orbe, 2008). FGCSs are significantly more likely to come from underrepresented populations and take on additional responsibilities outside of the classroom (Callahan & Humphries, 2016; Engle & Tinto, 2008; Lohfink & Paulson, 2005), with the most common outcome being that students have a greater sense of familial responsibility and act as caregivers outside of school (Covarrubias et al., 2019; Orbe, 2004; Pyne & Means, 2013).

FGCS may find it difficult adjusting to the higher education system because of the close relationship between a student's academic experience and their familial positionality. They have a difficult time adjusting for a variety of reasons, such as academic under-preparedness, guilt

and anxiety from leaving their family, the need to juggle multiple identities at once (such as student and caregiver), the tension between independence (a student living on their own and supporting themselves) and interdependence (the dynamic of remaining inextricably linked with one's family), and a lack of social and academic capital, among others. In addition to coming from lower-income homes and having less academic preparation when they first enter college, FGCSs frequently exhibit other traits linked to lower rates of college enrolment and graduation (D'Amico & Dika, 2013; Engle, 2007; Nguyen & Nguyen, 2018).

### ***Online Learning among First Generation College Students***

The delivery of knowledge to learners who are unable to physically attend classes in person has been made possible by digital technologies, which have facilitated and empowered the learning process (Appana 2008). Students' capacity to use digital tools has enhanced their learning activities and positively influenced learning outcomes, which is in line with the growing utilization of digital tools in higher education. Computers, mobile devices (such as laptops, tablets, and smartphones), communication and collaboration tools, and a range of educational software programmes are examples of the technology used in education. Previous research on the "digital divide" revealed that young people from low-income homes had not yet overcome their relative disadvantages regarding access and use of the Internet and digital technologies (Livingstone & Helsper, 2007; Newman, Bierdrzycki, & Baum, 2010; Van Dijk, 2017). In comparison to continuing generation college students, it is likely that FGCS do not achieve the same adept level of technology use since they are more likely to come from low-income homes, hence under resourced in most cases (Engle & Tinto, 2008; Ilett, 2019). These findings have stark implications on the achievement of learning outcomes of FGCS who had to transition online at the peak of the pandemic. This transition from face-to-face learning to an online mode of study relied heavily on technology.

### ***Learning Performance of First-Generation College Students (FGCS)***

Many researchers have found that FGCS perform worse academically than students who are not first-generation (DeFreitas & Rinn, 2013; Stephens, Fryberg, Markus, Johnson, & Covarrubias, 2012). For instance, in a study conducted in Germany, Palbusa and Gauvain (2017) discovered FGCS' grade point averages (GPA) were lower than those of non-first-generation college students. A lower GPA, in addition, was far more likely to result in an FGCS dropping out of school than it would be for other students, according to Mehta, Newbold and O'Rourke (2011). On the other hand, students who were not FGCS were more likely to show

academic resilience despite subpar academic results. Similar conclusions have been made by other studies, who have discovered that one's perception of their academic prowess influences their academic achievement, which in turn influences their persistence and retention in college (Vuong, Brown-Welty, & Tracz, 2010). Among FGCS, decreased academic achievement and persistence rates may be caused by a number of factors. FGCS are typically less equipped academically for college entry and generally do not take as many advanced mathematics classes in high school (Chen, 2005). In addition, academic placement tests generally show FGCS scoring worse than continuing generation (Chen, 2005; Mehta et al., 2011). However, it is crucial to remember that FGCS still have a lower likelihood of graduating from college, even after accounting for their academic preparation before entering college, their performance there, and other demographic data (Chen, 2005; Strayhorn, 2007). Other reasons for relatively lower achievement of FGCS include insufficient study time and difficulty connecting with professors (Engle, 2007).

### **Research Design: Methods and Mode of Analysis**

This study utilized a mixed method approach with both qualitative and quantitative data collected. Considering this, the researcher adopted the pragmatism research paradigm, which incorporates both qualitative and quantitative approaches into a single study (Johnson & Onwuegnuzie, 2004). The qualitative strand of the study focused on the experiences of FGCS whereas the quantitative analysis established links between FGCS online learning, learning outcomes, and learning performance by means of a cross-sectional regression analysis. Data for the cross-sectional regression was collected through an online survey instrument.

To start with, we address the first objective, which is to identify the factors that affect the learning performance of FGCS. Guided by the Community of Inquiry framework, we first generate sub-indices for Social Presence (Sharing, Intimacy, Respect); Cognitive Presence (Triggering, Exploration, Integration, Resolution); and Teacher Presence (Design and Organisation, Facilitation, Instruction) from the survey data using factor analysis. The sub-indices are then combined into an overall measure of online learning. We regress the sub-indices of online learning-social, cognitive and instructor presence on student learning performance. Student learning performance is measured using the difference between student CGPA prior to COVID-19 and the CPGA of students after being online for a semester.

We also address the second objective which is to identify the factors that influence the achievement of learning outcomes of GFCS through regression analysis. The sub-indices of

online learning guided by the COI framework, social presence, cognitive presence and instructor presence as well as the overall index of online learning, is regressed on selected learning outcomes. The learning outcomes selection was guided by university-wide learning outcomes that students are expected to achieve as they take their different courses. The learning outcomes are critical thinking, communication, leadership and teamwork, curiosity and skill as well as professionalism.

Thematic analysis was used in analysing data collected through Focus Group Discussions as part of qualitative analysis. The analysis from the thematic analysis addressed both first and second objectives.

We also investigate one of the fundamental assumptions underlying the study, which is to determine if the move online led to a significant difference between the learning performance of FGCS and non-FGCS. This objective is addressed via means of a *t*-test analysis.

## **G. Population and Sample**

Students at a private university in Ghana made up the study's population. There are 1173 students, who come from 28 different nations, enrolled at the university. A sampling frame of all FGCS was provided to the research team by the university's admission department. The survey instrument was then sent to all students in this sampling frame; 120 students who had experienced both face-to-face learning and online learning as a result of the COVID-19 pandemic responded to the survey that was sent out.

In a qualitative study, there is an attempt to understand smaller number of participants' worldview rather than testing hypotheses based on a large sample (Hellström, 2008). Therefore, two rounds of focus groups were conducted with 10 participants in each focus group.

## **H. Data Collection Procedure**

An email was sent to all FGCS in the sampling frame to recruit students who were interested in taking part in the survey to sign up using a link that had been emailed to them. A google form survey link was attached to a follow-up email to gather information from the students who freely volunteered their time to participate in the study. Participants for the Focus Group Discussion were selected in similar fashion, first with a call for a voluntary expression of interest and then a random selection of students who fit the FGCS criteria for both rounds of the Focus Group Discussion.

## I. Ethical Considerations

The study adhered to ethics guiding research by following the guidelines for collecting data from human subjects with the University's Institutional Review Board. Prior to the data collection exercise, the research team applied for ethical clearance from the University's Institutional Review Board. Data was only collected after the board had given approval.

### Research Findings

To address the objectives of the study, thematic analysis of FGD scripts, an independent t test and multiple regressions were conducted. The multiple regressions were used to analyse the significant predictors of academic performance and learning outcomes of FGCS. However, prior to conducting the multiple regression, an intercorrelation matrix was conducted to establish the plausible relationships between the study variables.

On the other hand, the independent t test was used to establish differences in the academic performance between FGCS and Non-FGCS. The below tables below present summaries of the results from the analysed data.

Normality of the underlying data is an important assumption to verify prior to a *T*-test or regression analysis. However, in this study normality is assumed as a result of the large data size, ( $n > 30$ ) as the central limit theorem applies.

As shown in the correlation matrix in Table 1, the variables that significantly related with FGCS learning performance (measured using CGPA) were cognitive presence [ $r = .33, p < 0.01$ ] and teaching presence [ $r = .24, p < 0.05$ ]. These significant relationships warranted further statistical analyses (using multiple regression) to establish more precise associations between the study variables. We also establish based on the correlations that multicollinearity will not be a problem in the regression as the correlation co-efficients are largely below the rule of thumb of 0.50.

**Table 1 (Revised – see below for original)***Correlation Matrix*

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. CGPA	1.00												
2. Parent did not graduate college	0.19	.00											
3. Parents attended post-secondary	0.06	0.04	.00										
4. Owned by household	0.20	0.16	0.15	.00									
5. Main source of income	0.06	0.09	0.23*	0.06	.00								
6. Both parents employed	0.10	0.06	0.06	0.38**	-0.09	.00							
7. Parents occupation	0.12	-0.01	0.25*	0.22*	0.13	0.11	.000						
8. Work during COVID	0.04	0.25*	0.04	0.40**	0.27*	0.17	0.33**	.000					
9. Work for living expenses	0.03	0.38**	0.11	0.17	0.11	0.00	-0.16	0.44	.000				
10. Social presence	0.07	0.06	0.28*	0.31**	0.13	0.24*	0.12	0.02	0.22	.00			
11. Cognitive presence	0.33**	0.13	0.25*	0.18	0.11	0.07	0.30**	0.04	0.10	0.57**	.00		
12. Teaching presence	0.24*	0.00	0.21	0.22*	0.33**	0.23*	0.30**	0.15	0.15	0.36**	0.62**	.00	
13. Online learning	0.14	0.15	0.15	0.21	0.28*	0.20	0.21	0.04	0.01	0.55**	0.67**	0.68**	.00

As shown in Table 2, panel 1 which included demographic variables accounted for 24.6% of the variances in the academic performance of First-Generation College Students [ $R^2=0.246$ ,  $p>0.05$ ]. Further, none of these demographic variables significantly predicted the academic performance of FGCS.

**Table 2**

*A summary of the multiple regression showing the predictors of FGCS learning performance*

	Beta	t	p	R <sup>2</sup> change
<b>Panel 1:</b>				.246
Age	0.306	1.898	0.065	
Gender	-0.071	-0.473	0.639	
Parents attended college but did not graduate	0.231	1.454	0.154	
Parents enrolled in post-secondary educational program	0.005	0.035	0.972	
Owned by household	-0.156	-0.857	0.397	
Main source of income	0.179	1.106	0.276	
Employment status of parents	-0.042	-0.263	0.794	
Occupation of parents	-.213	-1.238	0.223	
Work during COVID	-0.254	-1.335	0.190	
Work to cater for living expenses	-0.015	-0.085	0.932	
<b>Panel 2:</b>				.334
<b>Social presence:</b>	<b>.124</b>	<b>.566</b>	<b>.575</b>	
Sharing	0.085	0.194	0.848	
Intimacy	0.075	0.256	0.800	
Respect	0.091	0.203	0.841	
<b>Cognitive presence:</b>	<b>.248</b>	<b>.763</b>	<b>.451</b>	
Triggering	-0.097	-0.390	0.701	
Exploration	-0.159	-0.471	0.643	
Integration	0.362	0.762	0.455	
Resolution	0.429	1.061	0.301	
<b>Teaching presence:</b>	<b>.387</b>	<b>1.281</b>	<b>.209</b>	
Design & organisation	-0.334	-0.786	0.441	
Facilitation	-0.220	-0.662	0.516	



	Beta	t	p	R <sup>2</sup> change
Instruction	0.582	1.146	0.265	
<b>Learning outcomes:</b>	<b>.404</b>	<b>1.333</b>	<b>.192</b>	
Critical thinking	0.483	1.068	0.298	
Communication	0.135	0.212	0.835	
Leadership and teamwork	0.067	0.115	0.910	
Curiosity & skill	0.098	0.175	0.862	
Professionalism	0.041	0.106	0.917	

Panel 2 which included social presence (sharing, intimacy and respect); cognitive presence (triggering, exploration, integration and resolution); teaching presence (design, facilitation and instruction) and learning outcomes (critical thinking, communication, leadership, curiosity and professionalism) jointly explained 33.4% of the changes in the academic performance of FGCS [ $R^2=0.334$ ,  $p>0.05$ ]. Further, none of the variables significantly predicted academic performance of FGCS.

As shown in Table 3, step 1 which included demographic variables accounted for 39.4% of the variances in the learning outcomes of FGCS [ $R^2=0.394$ ,  $p<0.05$ ]. Further, the significant demographic predictors of learning outcomes included age [ $\beta=-.271$ ,  $p<0.10$ ], FGCS who have parents who attended college but did not graduate [ $\beta=.263$ ,  $p<0.10$ ], gender [ $\beta=-.396$ ,  $p<0.01$ ] and FGCS who work to cater for their living expenses [ $\beta=-.278$ ,  $p<0.10$ ].

**Table 3**

*A summary of the multiple regression showing the predictors of FGCS learning outcomes*

	Beta	t	p	R <sup>2</sup> change
<b>Panel 1:</b>				<b>.394***</b>
<b>Age</b>	<b>-.271</b>	<b>-1.88</b>	<b>.07</b>	
<b>Gender</b>	<b>-.396</b>	<b>-2.95</b>	<b>.01</b>	
<b>Parents attended college but did not graduate</b>	<b>.263</b>	<b>1.846</b>	<b>.073</b>	
Parents enrolled in post-secondary educational program	.051	.373	.712	
Items owned by household	.139	.852	.399	
Main source of income	.137	.942	.352	
Employment status of parents	.044	.309	.759	
Occupation of parents	.241	1.474	.149	

	Beta	<i>t</i>	<i>p</i>	<i>R</i> <sup>2</sup> change
Work during COVID	.106	.620	.539	
<b>Work to cater for living expenses</b>	<b>-.278</b>	<b>-1.7538</b>	<b>.088</b>	
<b>Panel 2:</b>				<b>.868***</b>
<b>Social presence:</b>	.032	.261	.796	
Sharing	-.189	-.940	.356	
Intimacy	-.072	-.546	.590	
<b>Respect</b>	<b>.466</b>	<b>2.583</b>	<b>.016</b>	
<b>Cognitive presence:</b>	<b>.373</b>	<b>2.170</b>	<b>.037</b>	
Triggering	-.141	-1.234	.229	
Exploration	.082	.544	.591	
Integration	.207	.964	.345	
Resolution	.213	1.321	.199	
<b>Teaching presence:</b>	<b>.416</b>	<b>2.638</b>	<b>.013</b>	
Design & organisation	-.073	-.358	.724	
Facilitation	.020	.161	.874	
Instruction	.199	.876	.390	
CGPA	.104	.997	.329	
	<i>*p</i> <0.10	<i>**p</i> <0.05	<i>***p</i> <0.01	

On the other hand, social presence (sharing, intimacy and respect), cognitive presence (triggering, exploration, integration and resolution), teaching presence (design, facilitation and instruction) and CGPA jointly explained 86.8% of the changes in the learning outcomes of First-Generation College Students [ $R^2=0.868$ ,  $p<0.01$ ]. However, the only significant predictors of the learning outcomes of First-Generation College Students were respect [ $\beta=.466$ ,  $p<0.05$ ], cognitive presence [ $\beta=-.373$ ,  $p<0.05$ ] and teaching presence [ $\beta=.416$ ,  $p<0.05$ ].

## J. Independent T-Test Results

The independent t test was used to analyse differences in performance by gender with a focus on the full sample of FGCS. Additional analyses were conducted to examine the differences in learning performance between first-generation college students (fgcs) and non-first-generation college students (nfgcs) measured by the difference between their pre- and post-pandemic CGPA. The summaries of the results are presented in Tables 4 and 5.

As shown in Table 4, there were significant differences between males [mean=4.40,  $SD=.68$ ] and females [3.59,  $SD=.95$ ] on ethics [ $t_{(46)}=3.597$ ,  $p<0.05$ ], males [mean=4.40,  $SD=.68$ ] and females [mean=3.59,  $SD=.95$ ] on professionalism [ $t_{(46)}=3.597$ ,  $p<0.05$ ].

**Table 4**

*Independent T-test results - Differences in learning outcomes by gender (FGCS sample)*

	Gender	<i>N</i>	Mean	<i>SD</i>	<i>df</i>	<i>t</i>	<i>p</i>
Ethics	Males	25	4.4400	0.68191	46	3.597	.001
	Females	23	3.5870	0.94931			
Critical thinking	Males	25	3.9100	0.90967	46	1.943	.058
	Females	23	3.4203	0.82934			
Communication	Males	25	4.0500	0.89559	46	1.911	.062
	Females	23	3.5435	0.94042			
Leadership & Teamwork	Males	25	3.9500	0.74652	46	1.823	.075
	Females	23	3.5181	0.89293			
Curiosity	Males	25	4.0000	0.80364	45	1.861	.069
	Females	22	3.5000	1.03510			
Professionalism	Males	25	4.4400	0.68191	46	3.597	.001
	Females	23	3.5870	0.94931			

As shown in Table 5, there was no significant difference between the pre and post pandemic CGPA of FGCS and NFGCS (mean=3.19, SD=.60) and NFGCS (mean=3.18, SD=.60) on academic performance [ $t_{(302)} = .14, p > 0.05$ ].

**Table 5**

*Academic performance of FGCS and NFGCS students*

	Students	N	Mean	SD	df	t	p
Academic performance	FGCS	152	3.19	.60	302	.14	.89
	NFGCS	152	3.18	.60			

## K. Thematic Analysis

The thematic analysis revealed several factors that influence the learning performance and outcomes of FGCS and each of them are discussed below. See transcriptions from FGD's in Appendix 3.0, for context.

### ***Psychosocial Resources***

#### ***Sub-Themes:***

##### a. Personal Resources

**Codes:** Self-determination, Open-mindedness/willing to learn, Independence, Mentorship, Perseverance/resilience, Self-discipline, Concentration.

Research participants noted determination as a key characteristic that helped their transition to online learning during the pandemic. The need to adapt to new systems was abrupt and required motivation, discipline, zeal and resilience; skills FGCS tend to build themselves due to limited support from family and other external sources. Most FGCS used this as an opportunity to set a good example to younger siblings who are on the path to college as well. The internet, electricity, and other challenges rampant amongst under resourced groups in an online learning environment required high levels of resilience and the ability to bounce back. Although FGCS generally performed well in teams, some FGCS noted their preference for working independently (mainly due to being the first born) as a prejudice that hindered their teamwork efforts.

##### b. Social Resources

**Codes:** Teamwork/cooperation, Supportive parents and siblings, Reliance on friends, Good team player, Less difficulty with teamwork, Motivation from past experiences of others, Follow-ups on team members.

Online learning requires substantial teamwork and can create challenges for students. Some FGCS engaged for this study compared teamwork in an online learning environment to teamwork with siblings and other relatives in the household. Their early exposure to people management and teamwork in the home-made transitioning from teamwork in the classroom to online relatively easier regardless of the scheduling and other related challenges that occurred. Generally, FGCS noted they worked better in teams during the online learning period and resorted to platforms like WhatsApp to communicate and keep up to date on team tasks. Some FGCS parents expressed very keen interest in their ward's (online) education even though they did not receive higher education themselves. These parents gave some leeway for house chores, ensured other relatives in the household maintained as much composure as possible when online classes were ongoing, provided some motivation and pep talks where possible, etc. Their value for education stemmed mostly from their understanding of what they (i.e., the parents) missed out on and the desire to see their wards achieve more. Apart from FGCS who joined the University with others from the same high school, very few made enough friends to rely on them for support or motivation during the online learning period.

### ***Techno-environmental Resources***

#### ***Sub-Themes***

##### a. Conducive home environment

**Codes:** Personal space for students, stable internet, used parents' rooms for studies

FGCS students from financially sound households were provided with rooms, personal space, stable internet and other necessary resources to make online learning convenient. Noise from others in the household were limited to an extent, hence concentration levels were generally okay amongst some FGCS. Due to limited technological competence of most parents, FGCS received relatively less support or guidance from their households in adapting to the new technology. Others from under resourced homes made do with the space at home, and their families tried to accommodate their learning even though there were some disturbances. Some parents went to the extent of making their (the parents') bedrooms available to their wards to study in, as these rooms were more convenient and, in some cases, a better place to access the internet.

##### b. Technological Resources

**Codes:** Research/online resources, easy communication on virtual space, Friendship through virtual space, Easy to understand online lessons, Exposure to varying study materials and online tools.

Due to limited guidance from the household in adapting to these new technological systems, some FGCS resorted to online resources, videos etc. to learn how to efficiently use said tools. Their zeal, motivation and resilience pushed them to read more about the new technologies and figure things out on their own (i.e., independence). FGCS who participated in this study did not experience challenges navigating online communication channels. Most of them believe this seamless experience had little to do with their FGCS status but came naturally as the online environment required a substantial amount of teamwork and communication via instant messaging platforms (specifically WhatsApp). Although this social experience was very successful, some FGCS who participated in the FGD noted they encountered challenges making friends in-person as compared to when classes were online. Some also reported better retention and understanding of course content during the online period. In person classes restrict the use of phones and laptops in class; however, doing nothing aside from listening to a lecture was tough for most students. Online learning gave the students good exposure to a variety of online tools to help improve themselves. This was highly commended, and a key reason why online learning might be preferred in comparison to in-person classes.

### ***Socio-environmental Hindrances***

#### ***Sub-themes***

##### a. Unconducive home environment

**Codes:** Disruption at home/noise, Unstable/poor internet, No access to electricity, Study at night.

FGCS from under resourced households or ones with several siblings in relatively small households experienced disruptions while studying online due to noise, unstable internet, interruptions from family members due to shared spaces or relatively small study areas. It took a lot of adapting to this in the first few weeks, together with changes associated with technology and other learning requirements. Most parents were very supportive in these cases and had conversations with others in the household, set ground rules, etc., in the attempt to make their wards' online learning experience fruitful. In adapting to these living situations, some FGCS resorted to studying at night so they could have the needed focus.

FGCS who lived in neighborhoods still under development or who just could not afford stable electricity and/or internet were at a disadvantage as they could not move from their homes to convenient spaces due to lockdowns. Some bold FGCS attempted to move from their locations to access internet elsewhere and had to answer to security personnel, which took a lot of time and could be demeaning in some scenarios.

b. Social Hindrances

**Codes:** Difficulty in scheduling and work in groups, less active on social media, no knowledge of people around, not aware of available resources, Communication gap between lectures and students, Felt distanced.

Although most FGCS highlighted the ease with which they managed teamwork, they also acknowledged the difficulties associated with scheduling meeting times and team members who put in very little effort or constantly made excuses for sub-par work. Some participants compared situations where team members did not contribute effectively to team efforts to times where their siblings may have bailed out on errands in which they were paired to work together on. Some research participants expressed difficulty in engaging socially online due to their preference for in-person interactions. Another remarked on how their relationships with faculty significantly improved when the university transitioned back to in-person teaching and learning. Participants expressed concern on limited awareness about tools that help students thrive in an online learning environment, and household unawareness of their classroom and other curricular expectations, which resulted in little empathy. First year FGCS whose first encounter with higher education was online were unaware of online office hours and other opportunities for support. As a result, they resorted to their independence and worked towards getting through the module with little guidance.

***Learning Outcomes***

***Sub-themes:***

a. Performance using online method

**Codes:** Improved/better performance during online lessons, Freedom to express ideas, No improved performance during online lessons, Less effectiveness during online lessons, Less effectiveness during online lessons, Less interaction during online lessons.

There were mixed sentiments amongst participants on their performance levels during the online learning period. Some students noted access to more learning materials as a key factor that helped improve their performance, as well as the ability to multitask and manage time better. as there was very limited movement (moving from one lecture hall to another for classes, walking to classes from hostels and back, etc.) Others commended the freedom to express ideas without suppression while online; however, concentration levels and engagement were not the best for them even in some teams. Limited guidance on using some online learning tools affected the student's ability to innovate.

b. Performance using face-to-face method

**Codes:** Better performance during in-person lessons, better to share ideas in person, Used office hours prior to online classes, Improved performance on specific task(s).

FGCS commented on the novelty of online learning and how the transition back to in-person, which was a more familiar mode of learning, was more welcoming for them. Participants noted in-person improved their concentration, contribution and confidence. Students felt more innovative and motivated in-person with higher engagement amongst students with similar interest. Office hours were not as utilized during the pandemic online period; however, participants did note they took advantage of office hours during in-person classes. One participant preferred a hybrid mode of learning and shared reflections on improved content understanding during online lessons, but a preference for hand-written in-person assessments.

## **Discussion**

### **L. Predictors of Academic Performance among FGCS**

Evidence from the study indicated that among the predictors (social presence, cognitive presence, teaching presence, learning outcomes and online learning) of academic performance among FGCS, cognitive presence and learning outcomes were the significant variables.

Thus, in enhancing the academic performance of FGCS, the ability to overcome computer and technology related problems when lessons were conducted online, to make use of electronic library resources, to participate in online class discussions, to make meaning of teaching and learning materials during online lessons, to make personal reflections, to critique issues, and to easily apply knowledge from online lessons (indicators of cognitive presence), the design and organisation, instruction and facilitation of teaching (indicators of teaching presence) are very crucial. In congruence with the qualitative study, personal resources that encompass self-determination, resilience, open-mindedness and other attributes were identified as an overarching theme. These findings corroborate the existing literature (see Garrison & Gardner, 2012).

Similarly, an improvement in FGCS' academic performance is accounted for by their achievement of learning outcomes in the areas of communication, teamwork, critical thinking, ethics, innovation, technological competence, and professionalism. This finding was re-emphasized in the qualitative study as learning outcomes (both positive and negative outcomes) were identified as one central theme. As also indicated in the extant literature (see Livingstone & Helsper, 2007; Newman et al., 2010; Van Dijk, 2017), learning outcomes are very crucial in determining the level of academic performance among FGCS.



### **M. Predictors of Learning Outcomes among FGCS**

As demonstrated in the study, learning outcomes included an array of indicators including freedom to express ideas and frequent interaction and sharing of ideas (revealed in the qualitative study), communication, teamwork, critical thinking, ethics, innovation, technological competence and professionalism (indicated in the quantitative study). The indicators were witnessed to be highly explained by the online learning experiences of FGCS including the perceived ease of use of online teaching and learning medium, availability and accessibility to IT infrastructure, and the perceived benefits of online learning. It is also not surprising that techno-environmental resources were found as another overarching theme in the qualitative study.

On the other hand, socio-environmental hindrances that embody uncondusive home environments, unstable internet connectivity, erratic supply of electricity, difficulty in scheduling online group meetings, less activeness on social media, and communication gaps between lecturers and students, as disclosed in the qualitative study, serve as hindrances to the positive learning outcomes among FGCS. This finding is also not far from the reach of other related studies. For instance, empirical studies by Livingstone and Helsper (2007), Newman et al., (2010) and Van Dijk (2017) all point to the crucial role of online learning experiences (both positive and negative) in explaining the learning outcomes of FGCS.

### **N. Differences in Academic Performance between FGCS and Non-FGCS**

As revealed from the study, differences in the academic performances of FGCS and NFGCS were not significant. Even though FGCS are generally disadvantaged in terms of resources necessary for academic success such as social capital, finance, access to internet and electricity, and conducive home environments, they possess outstanding features including being resourceful, independent, strategic thinkers, self-reliant, perseverant, confident, and civicy engaged, which are fundamental to academic achievement. These positive and outstanding features of FGCS, compared to NFGCS, enable them to equally thrive in their academic journey. Although dominant extant literature favor NFGCS for better academic performance (see DeFreitas & Rinn, 2013; Palbusa & Gauvain, 2017; Stephens et al., 2012; Vuong et al., 2010), the unique qualities of FGCS enabled them to close the gaps in their academic performance (Garrison & Gardner, 2012).

### **O. Limitations of the Study**

The current study, like many other studies, is accompanied by some limitations. Findings from this study should be interpreted with much caution because FGCS from a private university may not be a true representation of the larger university population. In line, future studies may consider choosing samples from various universities in order to improve on the generalizability of the current results.

Also, the present study made use of a relatively small sample size, which also affects the generalizability of the findings. Future studies should consider making use of a larger sample of first-generation college students. Given the short time frame of the study, long-term predictions about academic performance were difficult to determine. A different study could take a longer longitudinal approach that would track students over the course of their college career to assess the impact of learning outcomes and academic performance.

## **P. Implications of Findings**

Educational institutions and other stakeholders of FGCS should collaborate in developing policies and training programmes that focus on building the personal resources (including self-determination, perseverance, self-reliance, self-confidence, and independence) of FGCS. When these personal resources of FGCS are enhanced, they are able to equally face the challenging demands of their academic journey and also thrive.

Further, there is a need for sharpening the learning outcomes of FGCS, particularly in the area of critical thinking. Thus, educational institutions and other stakeholders should always encourage FGCS to make personal reflections and critique issues with the purpose of increasing their capability to engage in critical thinking. This learning outcome in the long run enables FGCS to thrive in their academic work.

Similarly, stakeholders in educational institutions of FGCS should create needed supports, such as providing the necessary resources in teaching and learning. Further, teaching and learning resources will enable FGCS to better understand and easily apply their academic knowledge. The understanding and easy application of knowledge will foster their academic performances. In line with this, the design, organization, and instruction of teaching should highly engage FGCS.

Besides, there is also the need for parents and guardians of FGCS to create conducive home environments in order to enhance FGCS' academic learning. Conducive home environments for FGCS may involve, but are not limited to, less noise at home, access to personal space for learning, access to internet, and support with household chores. A conducive home environment will, to a large extent, enable FGCS to close their academic gaps.

## Recommendations

Some areas of recommendation for further research are listed below:

- a. Data could be collected and analysed for **correlation between instructor presence and cognitive presence for non-FGCS and results compared to ascertain if the results are significantly different from that for the FGCS.**
- b. Consider looking at the **positive teaching and learning practices adopted during online learning and analyze how they affected the learning process for FGCS.**
- c. Undertake a **thematic analysis to look at keywords, trends, and their implications** (to validate quantitative data collected and to see if the team could get interesting insights from the qualitative data on its own).
- d. **Conduct a similar study on non-FGCS and make deductions that could inform certain decisions and ideologies.**
- e. Consider the effects of **the pandemic on academic performance.** Data from this could inform how students are impacted by local or global unplanned occurrences, act of God etc.).
- f. **Conduct a similar study on students from the senior year groups, since these students experienced in-person lessons before the shift online.** This current study focused solely on first and second years. Results from studying these focus groups could give deeper insights into the major impact of online learning on these students. Even though post-COVID practices are returning to normal, it might never be the normal it used to be. and that includes current in-person studies or lessons.
- g. Explore the **correlation between how students maintain academic integrity and their academic performance** in this case, their CGPA.

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## Appendix

### Appendix 1.0: Survey Link

[Survey link](#)

### Appendix 2.0 Focus Group Discussion (FGD) Guide

#### Introduction

##### Characteristics of self

- Describe what you see as your academic strengths.
- Describe the personality characteristics that you believe have helped you to achieve. Describe your current interests.
- Describe your goals for the future (i.e., career, family).

#### Main session

##### Family

- Describe your parents' educational background and tell me about their employment. Describe your relationship with your parents and family members.
- How do you provide economic support to your parents?
- Describe your parents' attitudes toward your academic work and online learning.
- How do your parents provide support at home when it comes to your online learning?
- What resources of your parents or at home facilitate/hinder your online learning? (Probe into internet connectivity at home, disruption/personal space at home, parental support)

##### College

- Describe your college search and application experience. Explain why you chose to attend this college.
- Describe your college experience with particular reference to online learning (zoom, Webex, Microsoft teams, uploading assignments, contribution during discussion,)
- Describe any challenges or adversity that you faced being in college (probe into online learning challenges).
- Tell me about how the college has provided support in your online learning experience.

Describe your current friendships and significant relationships. How have these relationships contributed to improving your online learning?

##### Outcomes

- How has the college's online learning affected your learning outcomes (probe into teamwork, leadership, ethics, civic engagement, communication, critical thinking, innovation, curiosity, technological competence, professionalism).
- Tell me about your academic performance so far. How has the college's online learning affected your academic performance (students can compare with face-to-face learning)?

##### Closing session

Is there anything else we haven't discussed today related to your experiences in relation to online learning that you would like to share?

**Appendix 3.0: Focus Group Discussions Themes and Sub-themes**

Themes	Sub-themes	Codes	Quotes
Psychosocial resources	Personal resources	Self-determination	<p>Okay, sure. So, one characteristic that I will share that I will say has helped me during the online learning was determination because during the pandemic when we moved to online was when we were new to the system, and we had to do everything online. So, basically everything seemed new to me. And every single time there's something new to learn, there's something new to adjust to but because I was determined to learn and do better, I think that was what kept me through</p> <p>I think, because I had the motivation for being a first-generation student, I opened myself up to be exposed to relevant things that could help me as a young person growing up (Aaron, .....)</p> <p>In a way I get motivation from being a first-generation student to get that characteristic. (Aaron, ....)</p> <p>And I was very determined to not only succeed in my academics (Faith, .....)</p> <p>I would say one of my characteristics was the zeal to learn because coming into an environment where things are held online, which I am not used to, one thing that kept me going was the zeal to learn new stuff in terms of technology and how to survive during online classes (Gabriel, .....)</p> <p>I got my motivation internally and that is what encourages me to achieve my goals to also be a motivator to my younger siblings (Thomas, higher education of parents)</p>
		Open-mindedness/ willing to learn	<p>So, when the COVID thing started, and then we moved online, the whole online thing was new to me. And instead of saying, I can't adapt to the system, I decided, like give it a shot and like, approach it with an open mind to be able to learn the new things that are ahead of me. So, with my open mindedness, I was able to explore the online system, and, in the end, I was able to navigate my way through</p>
		Independence	<p>And I'm the first-born child. I like to do a lot of things on my own, or I like to get people to do things. So, teamwork wasn't really my thing (Henry, ....)</p>

Themes	Sub-themes	Codes	Quotes
			<p>And maybe because my past experiences in school I used to do things on my own I didn't really like working with people even if I have challenges solving a question. So, I think because of my background, being more individualistic than working with people was helpful during those times (Ernestine, ....)</p> <p>Yes, I think there is, in in the past, so growing up, I've always been on my own, like in terms of my academics and trying to navigate through things on my own (Henry, ....)</p> <p>So, I tend to do a lot of things on my own, figure things out on my own. Figure out a way forward, how to get myself to understanding (Henry, ....)</p> <p>And because I actually had difficulty communicating with people online, I tend to figure things out on my own almost every single time, especially with assignments and difficult lessons. (Henry, ....)</p>
		Mentorship	also being the firstborn in my family, I had to set an example for my siblings and show them that despite the challenges that come, discipline and hard work are important (Faith, .....)
		Perseverance/ resilience	Yes, with online studies for me, sometimes things don't really go as planned. Sometimes the grades aren't going well, or sometimes you have problems with your internet and it's affecting your quizzes like electric problems. But you'd still have to get back on track and not lose focus. Because you know what you are actually aiming so no matter how stressed you are you actually have to come back to being yourself
		Self-discipline	I managed to discipline myself both in class and outside. (Mansura, .....)
		Concentration	In class, I managed to pay attention to the lessons (Mansura, ....)
	Social resources	Teamwork/ cooperation	<p>So, throughout the online school, most of the things that we had to do were team-based stuff. For me, from the background I come from most of the things we do, we do them together because I have four other siblings. So, most of the things we do them together. So, I think my ability to work with my siblings, translated to the online school, which made me work better in the teams that I found myself through the online school</p> <p>Alright, so for me, I would say one characteristic that helped me during the online period was my ability to work in teams and with people (Aaron, ....)</p>

Themes	Sub-themes	Codes	Quotes
			<p>However, because I already had this characteristic of working with people in teams, I was able to go through it and enjoy whatever it is that was put before us during the online semester (Aaron, ....)</p> <p>teamwork is one thing that I found to be relevant in this age and time (Aaron, ....)</p>
		Supportive parents and siblings	<p>I think my parents are supportive. Even when I came to Ashesi my mom was asking me that during this vacation are we going to have extra classes, that she is going to pay for extra classes. So, I told her No. So, when it comes to my education, I think they are very supportive. They want me to get to the top, so I will say yeah, they are supportive (Abdul, .....)</p> <p>Okay, so I would like to talk about my mom because she's the only current active person in my life right now. Okay, her highest education was Junior High. She did write the BEC. So that is her highest education level. And pretty much I would say she really values education, because she believes that, you know, she didn't get the chance to further her education. So, she's trying as much as possible to give me the best education that she can afford (Erica, single parent)</p> <p>My parents are very supportive when it comes to my education because they want me to attain higher than what they were able to achieve. So, they try their best in terms of anyway they can help me when it comes to my education to get higher. And for their educational level, so I think my mom ended up primary or something. I'm not really sure. My dad went to vocational school (Jennifer, .....)</p> <p>So, I think my parents all got to primary school. For their take on education, I think they all want all their kids to really try to make it up the academic ladder. So, they are putting in the work so that we wouldn't end up like them. (Ernestine, ....)</p> <p>Okay, I think during the online class, online session, I was in school but then when I go on vacation my parents are quite supportive in the house, I don't work. Even my clothes my sisters wash them for me. So, mine is to just study and eat and sleep, that's it. So, they give me the full support. (Abdul Mumin, .....)</p>

Themes	Sub-themes	Codes	Quotes
			<p>So, during the online period I was also relieved of house choice like other and the environment was okay (Jennifer, .....)</p> <p>For me, my motivation was my mom. This is because during the online sessions she supported me very much in various ways. I was not doing any house chores. Anytime I had difficulties especially with internet connectivity I get tensed and would not know what to do. But my mom would come and talk to me; she was my greatest motivation. If I couldn't do something like an assignment, she gave me ideas - why don't you call this friend? what did your teacher say? I think for my online experience, she was one very important person that helped me and supported me. I didn't have to go and look for food or anything. Everything came to me, and she made a lot of things available for me (Alberta, .....)</p> <p>So, anything that does involve their help, they are willing to give in their support (Samuel, ....)</p> <p>But they've been really supportive. And although they're not really sure about the career that I'm taking and what it entails, they're always there for me (Faith, no formal education of parents)</p> <p>Well, she's always supportive (Daniel,)</p> <p>And I would say they both are very supportive (Ayishatu, basic education of parents)</p> <p>I think my parents are supportive, to an extent (Thomas, higher education of parents)</p> <p>My parents are both good supporters..... They provide full emotional and motivational support and have financial support towards my education (Mansura, .....)</p> <p>My mother mostly did the house chores giving me room for studies and concentration. The support system was 95% generally (Faith, .....)</p>
		Reliance on friends	<p>So, I didn't really have a lot of friends but then due to group work that I did, I got to meet new people and I sometimes reached out to them. I'm like, oh, do you understand this thing that was said, I got confused here and there. So, I think that was what helped me. (Jennifer, ....)</p>

Themes	Sub-themes	Codes	Quotes
			<p>Interestingly for me, and fortunately, I went to school with five other people from my high school and we were basically doing the same thing. So, in case I needed help, I mostly asked my friends. They were very helpful during those times and other people that I got to know from classes (Ernestine, .....)</p> <p>I had to figure out everything myself and the new friends that I made at Ashesi. (Sandra, ....)</p> <p>So, I used to make friends with some good students, and I will contact them later for explanation (Ayishatu, .....)</p>
		Good team player	So, as I shared earlier, about my family setting. I actually have four other siblings, so most of the time, we work together. So, when I actually got to know that most of the units in the online school had to do with teams, for me, it didn't difficult. It felt like normal, but this time you have to work with other people. Not your siblings. So, WhatsApp was the main platform. I had already been using WhatsApp for a while before that time. So, for me, it didn't feel like a hurdle (Sandra, .....)
		Less difficulty with teamwork	Okay, so during my online experience, I didn't really have issues working with teams (Pearl, ....)
		Motivation from past experiences of others	I knew it was going to be difficult, but I always told myself that if someone has been able to be successful with it, then I will as well (Samuel, .....)
		Follow-ups on team members	I think during the online studies, what I used to do was when we break into breakout rooms, I take down the names of all my roommates so after class I go back to the WhatsApp group, and I search for them and then we have discussions later (Samuel, .....)
Techno-environmental resources	Conducive home environment	Personal space for studies	Hello, please can you hear me? During online learning, I had a personal room with good connection. I mean, my parents are very supportive, so I did less to no chores, because I spent most of the time sitting in one place joining meetings here and there with assignments. So, I would say on the whole they were very supportive, and everything was great. Just that I will say because they are not up to that level of technology, they weren't able to help me with things like internet or maybe something technical or educational. (Ernestine, .....)



Themes	Sub-themes	Codes	Quotes
			<p>I also had my own room. I've always had my own room for some time now. So, we live in a three-bedroom house and then my room is like close to the hall. So, one of the problems that I was having was the sound from the TV, it was entering my room. So, my mom usually didn't turn on the TV. But then my siblings anytime they came from school, they just like wanted to turn on the TV so I had to make them reduce the volume small but then you still hear it. As for house chores I actually only did house chores on weekends and during the day, if there are any errands, when my younger siblings come from school they go and do that. So, during weekdays I was completely full. I did everything on weekends (Sandra, .....)</p> <p>Yeah, so for me I did have my personal space. And my little siblings you know, went to school or sometimes they were with their nanny, so they barely distracted me. And my mom was super supportive while everything, but I still did my house chores. I just did them on time and then went back to my studies. So yeah, pretty much that was it (Erica, .....)</p> <p>Okay, so for me during the online time, I really don't think there was something bad with my environment of study (Pearl, .....)</p> <p>..... since I have a personal space, I could adjust so I was able to adjust to the environment. It wasn't noisy. (Jennifer, .....)</p> <p>Concerning the issue of personal space, I had a personal space to learn. I wouldn't say, I had a personal space like an intentional place for me to sit and study. I just made use of my room (Aaron, ....)</p> <p>I had a corner of my own studies (Aline, .....)</p>
		Stable internet	<p>During the pandemic the internet was quite good. The environment was serene. My siblings are grown so the noise was manageable. (Faith, ....)</p>
		Used parents' room for studies	<p>For me, I used to study in my parent's room because it had a better internet connectivity than my room where I sleep with my siblings (Thomas, .....)</p>

Themes	Sub-themes	Codes	Quotes
	Technological resources	Research/ online resources	<p>So, what I did that helped me was relying more on online resources. So, I did a lot of research and because I was new to the system, I was just curious to know everything that I had no idea about. So, when I made something new, I just Googled it, or I asked (Jennifer, ....)</p> <p>Sometimes too as Jennifer said you have to do more research, because we are working online, and people were not readily available at the time. So, resource researching (Ernestine, ....)</p> <p>So, there are times I have to go online, find resources (Sandra, .....)</p> <p>I did a lot of research and try to figure things out on my own. And it always didn't turn out well. But sometimes it did turn out well. (Henry, .....)</p> <p>And so, I had to resort to using YouTube and other online platforms to get a better understanding of whatever I was struggling with (Aaron, ....)</p> <p>After class, I tried to visit the course materials and slides. If I didn't understand anything I researched online (Mansura, .....)</p> <p>YouTube and geeks for geeks, for instance, were my best pal when I didn't understand the concept (Thomas, .....)</p>
		Easy communication on virtual space	<p>Alright, personally for me, navigating the social space during the online period was seamless for me. And I don't think it was because I have any characteristic linked to me being a first-generation student. It was just, happening naturally. Because with my classmates, we had just a good time doing group work together meeting on Zoom, and it was just great. And we really interacted on WhatsApp, too. We used WhatsApp a lot to get information across each other, start friendships, talk about things outside of academic space and talk about general things. And I even think comparing that time to now where we are in person, with some things, I would say they were even better during the online period than we are doing in person currently. So, for me, that social experience was okay for me (Aaron, .....)</p>

Themes	Sub-themes	Codes	Quotes
		Friendship through virtual space	<p>Funnily enough, during the pandemic, I made more friends through social media, and we got connected after the pandemic (Faith,)</p> <p>It is difficult to make friends now than it was online (Samuel, .....)</p>
		Easy to understand online lessons	<p>But I better understood the mathematics that was taught when it was online as compared to the impersonal (Samuel, ....)</p> <p>With the in-person ones, they don't allow us to be using our phones. They want us to pay attention and paying attention is doing nothing aside listening to the lecture. But when the class is online, I have the free will to also take pen or paper and follow up with whatever the teacher is doing. Maybe it might not be necessarily looking at the laptop, throughout the lessons. But then the little things that I do aside, just looking at the lecture was what got me to understand things better when classes online (Samuel, ....)</p>
		Exposure to varying study materials and online tools	<p>For me, I'll choose the online, not because it may be added too much more to my academic standing. The idea of online did stop me from limiting myself to using just hardcopy textbooks, and then exploring more of the online space doing my own research online (Aaron, ....)</p> <p>I would say the online time gave me a better exposure to online tools that I could use to improve myself (Aaron, ....)</p> <p>Okay, so when, when it comes to the textbooks, it was very easy to get a variety of textbooks on the same subject. And then also the fact that I could use YouTube. In the case that I did not understand something that was taught in class. And then there are also many other platforms that were opened during that period for students. So, it was actually a very good experience (Faith, ....)</p>
Socio-environmental hindrances	Unconducive home environment	Disruption at home/noise	<p>I actually somehow live in a noisy house because there are kids. So, my parents tend to shout a lot. Yeah. So, initially, during the first few weeks of my online studies, I think the first two weeks were not the best. Sometimes you'd be in class and then the kids will be misbehaving. And then even the kids themselves make noise. So, I think I was having this conversation with my parents about what's happening. I brought it up and they tried their possible best to get the kids to keep quiet and they themselves too reduced how they shout to help me focus (Henry, .....)</p>

Themes	Sub-themes	Codes	Quotes
			<p>Okay. So, I think in the house, I have a small study space, and I have a lot of nephews, so they always make noise (Abdul, .....)</p> <p>One thing that I found challenging most with my online lessons was how to manage the background noise. I need them to be quiet for me to take my lessons (Samuel, .....)</p> <p>even with the little connectivity I had, I still had to deal with noise from my family. (Thomas, .....)</p> <p>The place that we were living in was not conducive, since it was noisy, and was close to the road. The other challenge was the fact that I share a room with my siblings, who will always come to play or watch TV in there. And it was hard concentrating (Faith, .....)</p> <p>There was too much noise for me, especially during presentations (Alberta, .....)</p> <p>But having to come up with excuses when you're being called that you are listening to recordings, or you're really listening to recordings, just so you can get a better understanding or just so you can make a connection to something you have found online, it was kind of difficult because they weren't used to that. (Aaron, .....)</p> <p>There were a lot of distractions (Aline, ....)</p> <p>Distractions both personal and surrounding. There were a lot of distractions like, I opened a lot of tabs, I couldn't concentrate that much (Aline, ....)</p>
		Unstable/poor internet	<p>Okay, thank you very much. I shared a room with my brother, and he was good. He actually gave me the space that and less disturbance. And my internet was very terrible. Because I sort of live in a new site and it's not the best like it was terrible. So, I had to get a MIFI and that helped (Henry, .....)</p> <p>..... aside the internet connection and some little distractions from my siblings, I guess (Pearl, .....)</p>

Themes	Sub-themes	Codes	Quotes
			<p>Yes, so we started I was having problem with I think I was using MTN and MTN around that area wasn't that great. So, every time I'm having problems, I'm out of the class meetings and all that. (Jennifer, .....)</p> <p>In addition, the connection there is very, very poor. So, I was very worried about the fact that we are doing everything online. It was my first time. I was happy I've gotten into university, but I was also scared because it was online, and I knew that my place is very bad because of network and electricity (Ayishatu, basic education of parents)</p> <p>The internet connectivity I would describe it to be my "enemy". This was because the internet connectivity was not strong in the new site I was staying in (Thomas, ....)</p> <p>The internet at home was really poor. (Aline, ....)</p> <p>I was always crying most of the time. This was because I had poor internet connection (Ayishatu, ....)</p> <p>It came to a time when because of COVID, there was this strict policy that no one should move out from their homes. In the regard to access good internet connectivity, I had to explain to military men, and police officers, the reason why I'm moving from my house, I had to tell them I was taking my classes online, and there's no connectivity and sometimes they would make me stand for an hour before they allow me to go to places like Dzorwulu in Accra (Thomas, .....)</p> <p>The main challenge that I had, was accessing the internet and a digital device (Faith, ....)</p> <p>Aside from the challenges, it came with like Internet connectivity.... (Thomas, ....)</p>
		No access to electricity	where I live had no electricity access because it is kind of a new site (Ayishatu, basic education of parents)

Themes	Sub-themes	Codes	Quotes
			no accessibility to electricity made the experience difficult at the first half (Ayishatu, basic education of parents)
		Study at night	So, I tend to sleep and wake up around 10. By then they are asleep and that time too parents will also be asleep, and I will keep on studying. (Abdul, .....)
	Social hindrances	difficulty in scheduling and work in groups	<p>The only challenge I had with working with teams was that you actually sometimes find it difficult to arrange for team meetings and all that. But when it comes to the work, from my experience, when I'm even asked to do something with my brother, sometimes they don't do it, they just leave it to me because I'm the younger one. So, in terms of like teamwork, when I had teammates who didn't want to do their work or didn't want to contribute, I was like, absolutely fine with me. I would do it on their behalf. But then the only problem was getting to meet people and deciding times to do stuff. That was the only challenge I had with the teams (Sandra, .....)</p> <p>And then the teamwork. Because we weren't all at the same place. It was very difficult to coordinate your team members to get everybody in a particular meeting. So sometimes, a meeting could be scheduled at two and you'd have only 50% of the members joining and others would complain they had network issues (Henry, ....)</p> <p>even though working in teams was a bit hectic. Some people use internet connectivity as an excuse to not attend group meetings, even if they have no challenges (Faith, .....)</p>
		Less active on social media	Yes, I'm actually less of a social media network person. I feel more comfortable when I'm interacting with people in person. Because I feel that the body language and facial expressions actually count a lot in communication, too. I'm not really comfortable but then I'd say that's my weakness that I'm actually working on (Henry, .....)
		No knowledge of people around	<p>But the people around me actually had zero knowledge about the courses that I was taking. My elder brother did graphic design and I'm doing computer science, so there's no relationship. There's nothing that I could ask him that he could help me (Sandra, ....)</p> <p>So, growing up my parents have had close to no knowledge about my education. And I also don't have any close relative that has climbed up the educational ladder. (Henry, ....)</p>

Themes	Sub-themes	Codes	Quotes
		Not aware of available resources	For my year group we actually started everything online. So, I wasn't really aware of the resources and the office hours available to be used and all that. So, I really didn't really engage much with faculty as at that time. For some courses it even felt like I was taking the course alone because sometimes, the lecturer will just ask you to go and read something and that kind of stuff. So, some of the courses you just feel like this course you're on your own but then for others, maybe I had some feeling that I had instructors and all that, but I didn't really make use of instructors and those things during the online school until like, when we came in person before I started interacting with them (Sandra, .....)
		Communication gap between lectures and students	I feel the lecturers didn't really communicate to us the available resources to help us understand or not navigate our way through the class. (Henry, .....)
		Felt distanced	So, in most of my classes, I felt I was taking the course on my own. You just go for lectures, you do your assignments, take your quizzes, then you take your final exam. (Henry, .....)
Financials	Economic hindrance	Financial constraints	However, in terms of the economies, they are not financially sound to give me the support (Samuel, ....)  it is just the finances that is a problem. (Daniel, single parent mother)
Learning outcomes	Performance using online method	Improved/better performance during online lessons	In terms of performance, online work better for me. (Alberta, ....)  for me, online learning helped improve my performance as I've got more access to learning materials (Faith, ....)  However, I will say online was somewhat effective, because I could do a lot just by sitting at one place, rather than moving from one class to the next class for class sessions (Thomas,)  I think online helped me to achieve all of them (Mansura, .....)
		Freedom to express ideas	I liked how no one was suppressing my ideas (Ayishatu, ....)
		No improved performance	Surprisingly, online classes did not improve my performance that much, since the levels of engagement and concentration were different (Aline, ....)

Themes	Sub-themes	Codes	Quotes
		during online lessons	
		Less effectiveness during online lessons	I feel this was not very effective online. For instance, I faced issues with developing something because I was like, I don't even have the tools and equipment here and there is no one to guide me that much to it. Okay, so innovation was limited (Ayishatu, ....)
		Less interaction during online lessons	I would like to comment on the teamwork. So, considering online learning, with teamwork, I would say online to me actually doesn't support the teamwork because sometimes, because you are not in person or there's no facial contact, and you sit behind screens, some people let me say, choose not to talk or let's say, engage in certain discussions, as opposed to in person where all members of the team try to come together and sit together to deliberate on a matters concerning what was given to them (Gabriel, .....)
	Performance using face-to-face method	Better performance during in-person lessons	I will say my performance in the in-person learning has been better than the online. Maybe this could be associated with the fact that online was strange to me (Daniel, ....)  In person was better for me because it improved my concentration, contribution and confidence (Ayishatu, ....)
		Better to share ideas in person	For the innovation, apart from maybe academic as acquire-you are able to see the person you are communicating with (Thomas, ....)
		Used office hours prior to online classes	Yep, thank you. So, for me, what I was used to before COVID was that if I had any challenges with understanding class content, I'll go to the lecture and try to get clarification (Aaron, ....)
		Improved performance on specific task(s)	For me, if I need to understand the topic very well, then it has to be online. But for me to perform better in quizzes then it has to be in person and more specific in writing than typing (Samuel, ....)  If let's say you're working on your own, I'll say maybe the online would be the best way. You can watch YouTube videos to force you to understand and innovate on what you're doing (Thomas, ....)  But for the in person, it increases teamwork. And there's no creativity without innovation. And for in person, you get to see people like face to face right? So, you



Themes	Sub-themes	Codes	Quotes
			get to somehow see like their thinking process and get to interact with them, brainstorm ideas together and reflect on what you guys are trying to do. So, I will say the in person has an advantage over the online in achieving teamwork, innovation and even all the other values (Thomas, ....)