



Managing large classes in virtual teaching: experiences of university teachers in Ghana during COVID-19

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Abstract

This research used the qualitative multiple case study and phenomenological designs to explore how, without training, university teachers in Ghana managed large student numbers in the virtual environment during COVID-19. The study examined further the challenges the teachers faced in their virtual instructional delivery. Twelve participants drawn purposively from four large Ghanaian universities participated in individual interviews and follow-up virtual class observations. The findings revealed that the participants employed two management techniques in their virtual teaching—regulating the behaviour of learners and controlling instructional content. The research further uncovered that, although the teachers' complaints generally centred on environmental constraints and inadequate institutional support, those whose difficulties included using virtual tools did not have virtual teaching experience before the COVID period. The study supports the clarion call on university teachers involved in virtual teaching to personally seek a continual update of skills and competency in virtual delivery because it is an approach hinged on evolving technology.

Keywords COVID-19 · Classroom management · Large classes · University teachers · Virtual teaching

Introduction

The growing popularity of virtual teaching in the last couple of decades has been attributed largely to the increasing awareness of the need to use technology innovatively to make education more responsive to the changing aspirations of learners (Blaine, 2019; González-Calvo et al., 2021; Shenoy et al., 2020). Multiple perspectives claim virtual teaching is synonymous with online instructional delivery and define it as the digital transmission of course content and reference materials to learners using platforms such

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as Massive Online Open Courses and Learning Management Systems (Barrett, 2010; Berry, 2009; Blaine, 2019; Elison-Bowers et al., 2011; Machado et al., 2020; Palloff & Pratt, 2013; Schutte, 1997). However, the use of virtual teaching in the current study is consistent with Falloon's (2011) assertion that:

... a virtual classroom is defined as a synchronous online learning environment that delivers course materials to learners and provides a live, contextual, and interactive environment for them. It also supports active learning by providing an environment with learning tools, learning materials, and opportunities for contextual discussion (p. 188).

Falloon (2011) argues that although online teaching and virtual teaching are related concepts, they are not synonyms. Whereas online teaching is an umbrella term covering both asynchronous and synchronous teaching methods, virtual teaching uses only the synchronous technique. Literature sources such as Elison-Bowers et al. (2011) and Falloon (2011) explain asynchronous as a technique widely used in distance education whereby instructors deliver course content earlier, and learners access the content later through any of the learning platforms mentioned in the first paragraph. The synchronous method is used in both distance education and regular education, allowing simultaneous teaching and learning in a virtual environment (Elison-Bowers et al., 2011; Falloon, 2011). In the synchronous online teaching technique, interactions between instructors (transmitters) and learners (receivers) are direct using instant text messaging or a variety of audio-visual media such as Zoom, Skype, Microsoft Teams, and Google classroom (Blaine, 2019). The flipped classroom is an example of virtual teaching because it enables instructors to make available course content to learners to peruse and prepare ahead of synchronous instructional delivery (Divjak et al., 2022; Elison-Bowers et al., 2011; Michael, 2012).

Virtual teaching has recently been the preference of many teachers and students in higher education because it makes instructional content simpler to deliver by teachers and easier to access by learners (González-Calvo et al., 2021; Yang & Liu, 2007). It is also advantageous because "digital communication cancels out both physical and mental distances between teachers and students" (González-Calvo et al., 2021, p. 3). However, it "requires the appropriate infrastructure, financial support, and strategic plan" (Palloff & Pratt, 2013, p. 106) to be successfully organised. Again, virtual instructors need to continually update their pedagogical techniques in order to satisfy the learning needs of the current generation of virtual learners (Barrett, 2010).

Following the outbreak of the COVID-19 pandemic in the latter part of 2019, the government of Ghana, like all others in the international community, took two crucial initiatives: First, to control the spread of the disease, and second, to mitigate its impact on critical sectors of the economy, including agriculture, education, energy, health, and industry. The second step made it necessary for the country to consider making structural adjustments to every facet of national life. In the education sector, schools and universities were initially closed down. The restriction was later relaxed for all educational institutions to reopen. In most Ghanaian universities, changes made as an emergency response to the pandemic soon became an opportunity to introduce more innovative teaching methods to suit the new social circumstance. The universities instituted two crucial measures to save the academic calendar from further disruptions. The first measure allowed students pursuing courses with smaller numbers to return to university campuses for face-to-face teaching, but with strict adherence, to COVID-19 protocols. The second course of action mandated students offering courses with large numbers to stay at home for virtual instruction instead

of the usual face-to-face learning. In this research, a large virtual class is a group with 150 students and above, as suggested by Elison-Bowers et al. (2011).

Information from the universities indicated that teachers of large classes, who were requested to resort to virtual teaching as a result of the pandemic, were required within a short period to transfer all instructional activities to online platforms and deliver instruction content via zoom, Microsoft Teams, Google Classroom, or Skype. This initiative perhaps supports Thatcher and Mooney's (2008) assertion that large class size is one of the key justifications for using technology in the classroom. However, the teachers did not receive prior training in the management of large virtual classes although it was new to them. As used in this context, virtual class management necessitates teachers to use appropriate techniques to control learners' behaviour within the virtual environment. It also requires them to make the course structure flexible and promote effective dialogue (interactions) to create learner-independence necessary for achieving instructional goals (Falloon, 2011).

Given that managing large classes in virtual teaching and doing so in person are not the same (Balcanao-Buco et al., 2020; Elison-Bowers et al., 2011), it was not clear whether the teachers managed their virtual classes effectively without compromising quality; and if they did, how did it happen? This lack of clarity appeared to have created a knowledge vacuum necessitating this research to achieve two objectives: First, to find out how university teachers in Ghana managed large student numbers in the virtual environment during COVID-19, and second, to explore the challenges they faced in their virtual instructional delivery. This research is significant because virtual teaching has advanced to a stage where its attention is focused more on quality interaction than class size (Elison-Bowers et al., 2011). More importantly, it helps us understand how effective teacher-learner interactions within the virtual space affect the success of higher education (Blaine, 2019).

Theoretical framework: Moore's (1993) theory of transactional distance

This research on the management of large virtual classes draws on Moore's (1993) Theory of Transactional Distance (TTD). The term "transactional distance" was first coined by Moore in one of his earlier writings on distance learning, where he defined the term as "the psychological and communication space between the learner and the teacher" (Giossos et al., 2009, p. 2). According to Moore (2013), transaction refers to the interplay among instructors and learners, behaviour patterns within a specific context, and the environment.

The TTD was relevant to the current research because the use of "distance" in its framing does not convey the literal meaning of a geographical distance between instructors and learners. Instead, it refers to "... the development of a particular form of interaction between the teacher and learner because of their geographical separation" (Giossos et al., 2009, p. 2). Essentially, the theory argues that the term "distance" in distance education is only "transactional, not spatial or temporal" (Gorsky & Caspi, 2005, p.2). It was, therefore, used to build the conceptual foundation of the research. In particular, it provided a broad framework for analysing the interplay among university teachers in Ghana, students, and the virtual environment. It served as a tool for assessing the efficacy of the virtual classroom as an alternative instructional delivery method to promote effective instructor-learner interactions, well-structured course content, and self-directed learning in higher education (Moore & Kearsley, 1996). Falloon (2011); and Ustati and Hassan (2013) posit that the success of any virtual teaching programme depends on three transactions described in the TTD as dialogue, structure, and learner-autonomy.

Dialogue has been explained as all forms of interactions that bring about cooperation and understanding between the teacher and learners (Falloon, 2011; Giossos et al., 2009; Solis & Turner, 2016). Emphasis is on the quality and effectiveness of interactions, which bring solutions to issues rather than the frequency of the interactions (Falloon, 2011). Dialogue is an interpersonal interaction and occurs when a course is already designed. It is constructive and aims to create knowledge in learners (Moore, 2013).

The second transaction is the rigidity or flexibility of the course structure (Falloon, 2011; Giossos et al., 2009). It includes the nature of the prescription of objectives, modes of assessments, and whether the instructional delivery uses the teacher-centred or learner-centred approach. The third transaction, learner-autonomy, is determined by the first two transactions because of its emphasis on learners' perceptions of independence and interdependence as they participate in learning activities. Learner-autonomy is connected to self-direction, which is ultimately affected by the effectiveness of dialogue and the flexibility of a course structure (Falloon, 2011). The TTD suggests that a contrary relationship exists between the three transactions (i.e., dialogue, course structure, and learner-autonomy) because an increase in one may cause a corresponding decrease in the other two (Falloon, 2011).

Techniques for managing large virtual classes

The literature is replete with views on virtual class management techniques. Balcanao-Buco et al. (2020) and Marzulina et al. (2021) see classroom management as applying strategies to achieve learning goals. It involves determining instructional content, setting rules of interactions, organising learners, resolving their challenges, regulating their behaviour, and keeping them actively involved in classroom activities. To manage large virtual classes effectively, teachers need to apply techniques that give learners the best learning experiences (Marzulina et al., 2021). In this regard, Elison-Bowers et al. (2011) recommend applying virtual classroom management techniques such as effective communication, using teaching assistants and multiple sections, appropriate virtual teaching methods, and professional practice in the virtual classroom.

According to Elison-Bowers et al. (2011), effective communication in large virtual classes is the most challenging aspect of the virtual teacher's management task because creating a community with many learners can be overwhelming. The authors suggest that to prevent isolation in the virtual classroom, the instructor should create an opportunity for learners to interact with one another, the instructor, and the course content. The focus of the instructional delivery should be on the learner-centred approach to allow learners to obtain feedback from one another. The course structure and feedback to learners should influence interactions. Because learners are not privileged to physically meet the instructor, "... making virtual connections is important and should include providing a photo, contact information, and may include a short biography" (Elison-Bowers et al., 2011, p. 58). The overall communication should aim at providing instruction and mentoring through "email and the course management system, which may provide a bulletin board or discussion board forums, chat rooms, and/or a virtual classroom" (Elison-Bowers et al., 2011, p. 58).

The course site should be the preferred platform for communication. However, individual communication channels such as emails or telephone could sometimes also be used despite being strenuous in large virtual classes (Elison-Bowers et al., 2011). Guidelines for communication should indicate the period for student phone calls and emails. Because

the class is large, the virtual instructor may choose to engage in email communication with smaller groups of students using personalised messages (Elison-Bowers et al., 2011). Although the virtual teaching itself is synchronous, communications may be synchronous or asynchronous, or a combination of both. However, combining the two formats is recommended because it allows “students to interact with the instructor, other students, and content in multiple ways” (Elison-Bowers et al., 2011, p. 59). Self-introduction during a first virtual session is also an important step towards establishing effective communication among students and building a virtual learning community. The students should be encouraged to share hobbies, interests, and photos and engage in peer review activities (Elison-Bowers et al., 2011).

The second virtual classroom management technique recommended by Elison-Bowers et al. (2011) is the use of teaching assistants (TAs). TAs may also be useful when a large virtual class is divided into multiple sections. The duties of TAs in such an arrangement are many, including course management, grading, monitoring discussions, and identifying learners who need additional help. However, TAs need to be trained to perform all virtual duties diligently (Elison-Bowers et al., 2011).

Using appropriate virtual teaching methods is the third virtual classroom management technique. Elison-Bowers et al. (2011) recommend that the teaching method should have a detailed course structure/design and utilise the learner-centred approach and modern technology. Elison-Bowers et al.’s fourth virtual classroom management technique enjoins instructors to show professionalism within the virtual environment. It involves being aware of and adhering to academic policies and ethical practices of an instructor’s institution and the larger global virtual community. In Elison-Bowers et al.’s view, instructors also need to have their teaching policies spell out clearly what constitutes academic misconduct within the virtual environment. The policies should be on institutional websites, course syllabi, and other sources students can easily access.

Challenges with managing large virtual classes

The difficulties associated with large class management in virtual teaching formats are many and varied. Examples cited in the literature include disobedience, noisemaking, lying, rudeness, and using mobile phones or talking to one another during virtual discussions (Asodike & Onyeike, 2016; Elison-Bowers et al., 2010; Gehringer, 2020).

Research suggests that most shy students avoid contributing to discussions and partaking in other instructional activities in large classes (Solis & Turner, 2016). Large class size also results in the use of the lecture method, which does not promote active learner participation in instructional delivery (Solis & Turner, 2016). Furthermore, teachers of large classes have difficulty assessing and helping weaker students (Balcanao-Buco et al., 2020; Elison-Bowers et al., 2010).

Methods

Research design

This research used the qualitative multiple case study design (Creswell, 2014; Denzin & Lincoln, 2011) to explore how university teachers in Ghana managed large virtual classes

during the COVID-19 pandemic. Based on the design, cases from multiple sources were combined and examined together in-depth (Creswell, 2014) using Moore's (1993) dialogue, structured course content, and learner-autonomy (Moore, 1993).

Participants and context

Twelve university teachers in Ghana participated in this research. The selection process began with initially choosing four universities because they were bigger higher education institutions in the country, in terms of staff and student population. We met with some heads of department of the institutions through whom we chose three participants from each institution because they were teaching large virtual classes for the sake of the COVID-19 pandemic. Table 1 presents the profile of the participants.

Ethics

We obtained ethical approval numbered ECH 101/21-22 from the ethical board of the lead author's institution. Participants endorsed consent forms before partaking in the research. Their participation was voluntary, and they had the right to withdraw from the study at any stage. We anonymised the identity of the participants and their institutions in reporting the results. For the purpose of ensuring rigor and trustworthiness, we made available the draft of the research report to participants to validate before writing the final copy. We also conducted an audit trail of the report after which we gave it out to two experts to read through. The feedback we received from them helped to revise portions of the report before publication.

Tools and data collection

The data collection exercise for this study began in early January 2022 and ended in late February 2022. Semi-structured open-ended interviews and virtual classroom observations were the tools used for the collection. We conducted one-on-one in-depth interviews with the 12 participants and later observed their virtual classes. The interviews were in-depth and lasted between 30 and 35 min. We used the Zoom platform for the interactions to avoid the risk of contracting COVID-19 through physical contacts. The participants' approval enabled us to record, transcribe, and store all the interviews in a secured cloud space.

In framing the questions on the interview schedule, we took into consideration Moore's (1993) views in his theory of transactional distance and the scholarly opinions of Balcanao-Buco et al. (2020), Elison-Bowers et al. (2011), González-Calvo et al. (2021); and Marzulina et al. (2021) on techniques for managing large virtual classes. We also took into account the authoritative assertions of Asodike and Onyeike (2016), Gehringer (2020), and others whose works we reviewed in the literature on the challenges of managing large virtual classes. Examples of leading questions on the interview schedule are as follows:

1. Explain how personally, a previous orientation in managing large virtual classes would have made you a better virtual instructor in the COVID period (Note: there was no appearance of concern in respondents answering this question).
2. How do you interact with your large number of students virtually? Do you think your interaction strategies promote effective learning? How? Please, explain.

Table 1 Profile of cases

Case	Participant	Gender	Age	Nationality	Teaching Experience	Course Taught	Level Taught	Virtual Class Size
#C1	P1	M	56	Nigerian	4 years	Communication Skills	Year 1	188
	P2	F	49	Ghanaian	9 years	Cartography	Year 2	391
	P3	M	43	Ghanaian	8 years	Industrial relations	Year 2	504
#C2	P4	F	54	Nigerian	11 years	Organisational Behaviour	Year 3	397
	P5	M	48	Ghanaian	3 years	Engineering	Year 1	256
	P6	M	53	Kenyan	22 years	Tourism	Year 1	452
#C3	P7	F	38	Ghanaian	8 ½ years	Fashion	Year 2	297
	P8	F	51	Ghanaian	10 years	Numeracy skills	Year 1	305
	P9	F	40	Ghanaian	5 years	Introduction to Adult Education	Year 1	701
#C4	P10	F	41	Ghanaian	6	Academic Writing	Year 1	367
	P11	F	58	Ghanaian	7	Abnormal Behaviour	Year 1	341
	P12	M	47	Ghanaian	7	Introduction to Special Education	Year 2	204

#C1—University 1; #C2—University 2; #C3—University 3; #C4—University 4

3. Please, what teaching methods do you use in your virtual classroom?

As a follow-up to the interviews, we obtained the consent of the participants and observed twice their two-hour individual virtual classes, after which we put together memos reflecting our thoughts on events. The main aim of the observations was to shed light on the interview data. Therefore, consistent with the elements in Moore's (1993) Theory of Transactional Distance, our reflections focused on the nature of virtual interactions, virtual teaching techniques, the structure of course content, and the promotion of self-directed learning.

Data analysis procedure

The overall body of data we analysed was 7653 words. We initially used NVIVO 11 qualitative software package to organise and code the data anonymously using #C1 for Case one, #C2 for Case two, #C3 for Case three, and #C4 for Case 4, each representing a selected university. For all the Cases, we also used the letter "P" for the participants and identified them as P1, P2, P3, etc. We subsequently used content and thematic techniques (Libarkin & Kurdziel, 2002) to analyse the data. Based on the first technique, we read through the data a couple of times to develop a coding scheme and discover new concepts, patterns, and relationships (Denzin & Lincoln, 2011). The second technique also enabled us to further categorise the data into three themes under which we classified the codes—managing learner behaviour, managing instructional delivery, and frustrations of managing large virtual classes. While using both techniques, we kept in mind the Theory of Transactional Distance (TTD) framework.

Under the first theme: "Managing learner-behaviour," the emerging codes were "setting rules," "muting microphones," and "removal from virtual classroom." Under the second theme: "Managing instructional delivery," the codes were "interactive learning environments" and "learner-centred approach." Under the third theme: "Frustrations of managing large virtual classes," codes explored included "frequent unexpected electricity power cuts," unstable internet connectivity," "learner reluctance to contribute to discussions," "lack of opportunity for physical contact with learners," and "unavailability of teaching assistants." These phrases were based on perceptible meanings in the body of the data and served as our variable unit of analysis. In the case of the memos on the observations, we interpreted interactions, reactions, and teaching techniques based on textual notes.

Results

This section presents the results of the individual interviews conducted with the 12 university teachers used in the study. Although we also observed and made memos on the teachers' management techniques for large virtual classes to compare with the interview data, the results are excluded from this presentation because they conformed to the interview information. The three themes that emerged from the interview data were managing learner behaviour in large virtual classes during COVID, managing instructional delivery in large virtual classes during COVID, and frustrations of managing large virtual classes during COVID. In presenting the results under the themes, the Cases would be identified in the following order, as indicated in the section on Data analysis procedure: #C1 for Case one, #C2 for Case two, #C3 for Case three, and #C4 for Case 4. Again, "P1", "P2", "P3",

and so on will stand for Participant 1, Participant 2, and Participant 3, and so on, respectively, from the Cases.

Managing learner behaviour in large virtual classes during COVID

This first theme emerged because the teachers claimed they had issues regulating the behaviour of large student numbers in their virtual classrooms, and the situation compelled them to resort to measures such as setting rules from the outset on how everybody should comport themselves and muting the zoom microphones of disruptive learners or removing them from the virtual classroom.

In her submission, P11 in #C4 asserted that “... *I set the rules with students before the lecture begins. For example, no one talks unless that person is called or uses the icon in zoom showing hand-raising*”.

In #C2, P6 instead indicated that “... *I instruct disruptive students to mute their microphones. If they refuse to do so after some time, I mute their microphones myself*”.

In #C1, the technique used was also different as P2 asserted, “*I temporarily take such students (disruptive students) out of the virtual class and bring them back after some time to see if they would change. If the behaviour persists, I take them out permanently.*”

Managing instructional delivery in large virtual classes during COVID

Another crucial issue the data revealed was the participants’ experiences controlling instructional content and its delivery process. They had the experiences through the attempt to create interactive virtual environments and to utilise the learner-centred approach. In the case of the interactive virtual environments, the data show the teachers allowed students to express themselves through responses to questions:

I ask questions from the beginning of the lecture to introduce my virtual lessons. The questions usually require my students to recall previous concepts based on which I teach new ones. Besides, I tolerate their questions at any stage within the lecture. The clarifications enable us to reflect together as the lesson progresses. (P9 in #C3)

P1 in #C1 shared a similar experience saying that “... *I ask questions when I’m done with my virtual lecture and randomly invite any student by name to speak*”. When I further asked how he identified the many students by their names, he responded that “*It’s easy to do this! At every virtual lesson, I request students to log in with their names for me to compile a class register, and this gives me access to names to mention any of them*”.

Besides the use of questions, the teachers also made their virtual lessons interactive through “... *virtual presentations by students using zoom and Microsoft Teams*” (P3 in #C1) and “... *WhatsApp video conference calls to hold discussions outside official times for lectures. We normally do so for me to clarify concepts not clearly understood earlier*” (P10 in #C4).

For the learner-centred method, the teachers gave group work to their students to encourage independent, interdependent, and cooperative learning among them:

I use breakout room in my zoom lectures. It allows the students to discuss among themselves in smaller numbers. When they return to the main session, their representatives lead the discussions. And I also encourage them to rotate so that at least more people talk in the virtual class. I also give them individual and group assign-

ments afterward and take attendance by downloading the list generated by zoom. (P8 in #C3)

For the same purpose, the teachers also used the flipped classroom and the case study techniques. While the flipped classroom enabled the participants “... to give students slides and reading materials to read through before our virtual lectures” (P1 in #C1), the case study helped “... students to have a practical understanding of learning concepts” (P11 in #C4).

The teachers also used a variety of techniques to assess their students. For instance, in #C2, P5 explained what he had been doing in the following excerpt:

I use a Moodle platform my university has adopted to assess analytical and writing skills. However, it's impossible to give immediate virtual feedback to students because of the class size, and it takes me about three weeks to complete marking their assignments individually. Although feedback may delay after the assessments, we meet via zoom to discuss some of the concepts I notice the majority couldn't explain well.

Besides written assignments, the teachers used “... the multiple-choice technique via google classroom” (P9 in #C3) to evaluate learning outcomes. They also created “... the supply or fill-in type of quizzes for them (students) using the Sakai Learning Management System. Sakai has the grade book facility, allowing students to access the results I publish” (P10 in #C4).

Frustrations of managing large virtual classes during COVID

This third theme delineates the challenging experiences the university teachers faced in controlling and supervising large virtual classrooms. According to the data, the participants in #C1 complained of frequent electricity power cuts, unstable internet connectivity, and the inability of students to access data for recurring virtual lectures. P1 commented, “... often my lessons end abruptly because of interruption in power supply. P3 also said, “Because I lack internet access in my house, I usually come to the university campus to use the internet facility, but connectivity is often poor.” P2 lamented, “... many of my students complain of the inability to buy data for continual lecture sessions.”

In #C2, P4 and P6 were concerned about the difficulty in getting many of their students to actively participate in discussions using virtual platforms such as “zoom, google meet, and skype, perhaps because of their shyness.” However, their counterpart P5 was disappointed that:

Unlike my previous face-to-face teaching, the virtual approach doesn't allow me to physically observe the level of attention students give to my lesson delivery. Perhaps, it would've been possible to do so if the class were a manageable small group to monitor their behaviour in the video.

In #C3, all the participants noted that their university assigned them teaching responsibilities over large virtual classes. However, there was no provision for teaching assistants (TAs) to help to monitor virtual learning activities. According to P8, a TA would have been helpful because “... the person (the TA) could have been organising virtual tutorials to assist students needing extra attention.”

In #C4, while P11 and P12 claimed they did not face any challenge with the virtual teaching task because they had had previous experience with it, their colleague P10 lamented her situation in the following quote:

Virtual teaching is new to me, and perhaps, to some of my students, as well. But for COVID, I would've been comfortably using my familiar face-to-face teaching and would've been able to manage my class more effectively even if it's big. You see, I'm saying all these because I'm old and nearing my retirement, and learning to adopt new technology is difficult for me. That said, I believe training would've been helpful to me no matter how difficult it would've been.

Discussion

The first objective of this study was to explore how university teachers in Ghana managed large student numbers in the virtual environment during the COVID-19 period. According to the results, the measures the university teachers adopted to control the behaviour of learners were either preventive, such as setting rules from the outset about participation, or punitive such as muting the microphones of disruptors or isolating them from the virtual class. In managing instructional content, the teachers created interactive virtual environments through questioning techniques, WhatsApp video conference teaching, and virtual presentations by students using the Zoom and Microsoft Teams. Based on the learner-centred approach, the participants used the Zoom breakout room facility, the flipped classroom, the case study techniques, and varied assessments strategies.

Moore's (1993) Theory of Transactional Distance (TTD) describes the relationship between teachers and learners in a virtual teaching programme as transactional and dependent on three factors—dialogue, structure, and learner-autonomy. The TTD enjoins virtual teachers to use dialogue and structured course contents to provide learners with “the sense of both independence and interdependence as they engage in the course” (Fallon, 2011, p. 190). The findings of this study suggest that, although almost all the participants did not have virtual teaching experience before the COVID pandemic began, they created interactive virtual environments to promote dialogue. For example, using questions to review students' previous knowledge and encouraging virtual presentations among students is consistent with Moore's assertion on the need to utilise dialogue to ensure cooperation and understanding in the virtual classroom.

Furthermore, the revelation that the teachers used varied techniques to ensure learner-centred teaching is something positive since the learner-centred approach is a flexible way of promoting learner-autonomy or self-directed learning, according to the TTD. The learner-centred approach also creates an opportunity for students to relate effectively with one another, the instructor, and the course content (Elison-Bowers et al., 2011). It brings about learning presence in the virtual classroom, which in Blaine's (2019) view, ensures that virtual learners benefit from self-regulation, self-efficacy, and motivation to master the demands of learning tasks. Again, the finding that the participants used preventive and punitive measures to manage the disruptive behaviour of their students validates Elison-Bowers et al.'s (2011) argument that creating a virtual community with many learners can be overwhelming for the teacher.

The literature suggests that virtual teaching requires self-introduction during a first virtual session. It also calls for the sharing of hobbies and interests as well as the use of course management systems, emails, and virtual connections that provide photos,

contact information, and short biographies of each participant because students do not have the opportunity to meet physically with instructors (Elison-Bowers et al., 2011). Policies guiding the virtual teaching policies should be on institutional websites, course syllabi, and other sources students can easily see (Elison-Bowers et al., 2011). Although the results show that the university teachers used course management systems (e.g., the Sakai Learning Management System) to deliver their course content, they failed to do the rest of the activities mentioned in the second sentence, probably because of the lack of previous training in virtual class management. Virtual training for the teachers was needful for two reasons: The first is because virtual teaching was new to them, and the second is because although the contents of virtual instructional materials are easy to access, they may be complicated to deliver (Palloff & Pratt, 2013). Research has found that because virtual teaching depends on technology, instructors need to regularly update their pedagogical techniques to satisfy the changing needs of the generation of virtual learners (Barrett, 2010).

Many literature sources have established that teaching assistants (TAs) play crucial roles in virtual teaching especially, larger classes (Blaine, 2019; Elison-Bowers et al., 2011; Michael, 2012; Palloff & Pratt, 2013). However, the results reveal that some participants complained of not having TAs to support them manage their large virtual classes. Perhaps, TAs would have assisted the teachers to divide their large virtual classes into smaller sessions so that one instructor may teach a session. The TAs could have also been helpful in course management, grading, monitoring discussions, and identifying learners who need additional help (Elison-Bowers et al., 2011).

The second objective of this study was to examine the challenges university teachers in Ghana encountered in their virtual instructional delivery during the COVID-19 period. The results show the following as the challenges: frequent unexpected electricity power cuts, unstable internet connectivity, learner reluctance to contribute to discussions, the lack of opportunity for physical contact with learners to monitor attentiveness, and unavailability of teaching assistants to help to monitor virtual learning activities. Interestingly, the participants whose threats included difficulty using virtual tools were those without virtual teaching experience before the COVID period. As noted earlier in this discussion section, such participants probably needed training.

It appears the concerns raised by the participants were justified because Palloff and Pratt (2013) argue that, for a virtual teaching programme to be successfully organised, there is the need to strategically plan its implementation and ensure appropriate infrastructure and financial support are in place. However, that aspect of the findings suggesting that some participants were frustrated that their students were reluctant to contribute to discussions may be due to shyness because research by Solis and Turner (2016) suggest that, to avoid being noticed, most shy students hardly contribute to discussions in large classes.

The current study affirms Balcanao-Buco et al.'s (2020) finding that teachers who handle large class sizes have difficulty assessing and aiding weaker students because that was a likely reason the participants complained of not having TAs to support them to manage their large virtual classes. The study also partly affirms Gehringer's (2020) earlier research concluding that disobedience and noisemaking were challenges facing teachers of large virtual classrooms. The supposition here is on the premise that if the participants did not experience disobedience, they would probably not have muted the zoom microphones of disruptive students or isolated them from the virtual classroom. Despite the affirmations, it appears the current study fails to confirm some aspects of the extant literature, especially Asodike and Onyeike's (2016) research citing lying, rudeness, and use of mobile phones as the main challenges facing virtual teachers.

Conclusion and implications for intervention

This study found that the university teachers employed two management techniques in their virtual teaching— regulating the behaviour of learners and controlling instructional content. The study also clearly shows that through teaching strategies, the teachers used dialogue and structured their course content and delivery to promote learner-autonomy in line with Moore's (1993) Theory of Transactional Distance. The research further uncovered that, although the teachers' complaints generally centred on environmental constraints and inadequate institutional support, those whose difficulties included using virtual tools did not have virtual teaching experience before the COVID period.

The study has highlighted the challenges university teachers in Ghana who handle large virtual classes face, especially during the COVID-era. The findings have underscored how urgent the issue is while seeking to create awareness of the status quo and improve future practices in the country and the world over.

Locally, given the growing interest in the adoption of hybrid teaching in Ghanaian higher education, the research findings draw the attention of policymakers to the need to address issues relating to unstable internet and unreliable electricity supply acting as setbacks to virtual teaching. The research findings also encourage higher education institutions in Ghana to introduce training programmes aimed at aiding teachers to manage large virtual classes and appropriately design and deliver the content of virtual course materials. Internationally, the study supports the clarion call on university teachers involved in virtual teaching to personally seek a continual update of skills and competency in virtual delivery because it is an approach hinged on evolving technology.

Finally, the advent of the COVID-19 pandemic has contributed to rapidly transforming the global higher education teaching landscape, making the traditional face-to-face teaching mode appear overshadowed by an increasingly popular virtual teaching format. However, it seems most higher education institutions in the developing world are still to come to terms with the reality. Given that this study was limited to only a Ghanaian sample, future research may focus on a cross-country inquiry using participants from multiple developing countries to compare the experiences of university teachers managing large virtual class sizes in the COVID period.

Appendix

Individual interview questions for participants

1. Please, what gender do you prefer for yourself?
2. May I know how old you are now?
3. What is your nationality?
4. How long have you been teaching in your present university?
5. What course do you teach?
6. At what level do you teach the course?
7. How many students do you have in your virtual class?

8. Did you teach about the same number of students or more in the face-face mode before the period of Covid?
9. Having experienced both face-to-face teaching and virtual teaching formats, would you say you've missed face-to-face teaching? If yes, why? If no, why not?
10. Do you like your experience of virtual teaching during Covid? Do you find it more stressful and time-consuming than the previous face-to-face teaching?
11. What concerns do you have and wish they were addressed?
12. Do you think training is necessary for virtual instructors? If yes, why? If no, why not?
13. Explain how personally, a previous orientation in managing large virtual classes would have made you a better virtual instructor in the Covid period.
14. How do you interact with your large number of students virtually? Do you think your interaction strategies promote effective learning? How? Please, explain.
15. Do you experience any difficulties using the strategies? If yes, what are they?
16. Do you facilitate interactions among students to promote cooperative learning? If yes, how do you do it?
17. Please, what teaching methods do you use in your virtual classroom? For example,
 - (a) How do you introduce your lessons?
 - (b) How do you ensure that your students are actively involved and participating in learning activities?
 - (c) What virtual tasks do you assign to your students to promote independent and self-directed learning?
 - (d) Because the class is large and not physically held, some students may engage in disruptive behaviour to frustrate the flow of your virtual lesson. How do you manage such a situation when it happens?
 - (e) Are the teaching methods all helpful? If not, which among them doesn't work well for you? Why is the situation so?
18. Let's now talk about evaluation and instructional feedback. How do you virtually assess the many students you have? By what means do you communicate feedback to students after the assignment? Any difficulties? If yes, what are they?
19. Please, do you involve teaching assistant(s) in your virtual teaching? If yes, what roles do they play? Do you see their role helpful? If yes, why? If no, why not?

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Informed consent Participants endorsed consent forms before partaking in the research.

References

- Asodike, J. D., & Onyeike, V. C. (2016). Managing large classes in developing countries. *Global Journal of Educational Research*, 15(1), 31–39.
- Balcanao-Buco, E. V. R., Gunnawa, V. V., & Mariani, M. J. P. (2020). Managing behaviour in large classes: Ceit faculty best Practices. *International Journal of English Literature and Social Sciences*, 5(6), 2547–2563.
- Barrett, B. (2010). Virtual teaching and strategies: Transitioning from teaching traditional classes to online classes. *Contemporary Issues in Education Research (CIER)*, 3(12), 17–20.
- Berry, R. W. (2009). Meeting the challenges of teaching large online classes: Shifting to a learner-focus. *MERLOT Journal of Online Learning and Teaching*, 5(1), 176–182.
- Blaine, A. M. (2019). Interaction and presence in the virtual classroom: An analysis of the perceptions of students and teachers in online and blended Advanced Placement courses. *Computers & Education*, 132, 31–43.
- Creswell, J. W. (2014). *Research design: Qualitative, quantitative and mixed methods approach*. SAGE Publications.
- Denzin, N. K., & Lincoln, Y. S. (2011). *The Sage handbook on qualitative research* (4th ed.). Sage publications Inc.
- Divjak, B., Rienties, B., Iniesto, Vondra, P., & Zizak, M. (2022). Flipped classrooms in higher education during the COVID-19 pandemic: findings and future research recommendations. *International Journal of Educational Technology in Higher Education*, 19, 9. <https://doi.org/10.1186/s41239-021-00316-4>
- Elison-Bowers, P., Henderson, K., Sand, J., & Osgood, L. (2010). Resolving instructor challenges in the online classroom. *The International Journal of Learning*, 17, 339–346.
- Elison-Bowers, P., Sand, J., Barlow, M. R., & Wing, T. J. (2011). Strategies for managing large online classes. *The International Journal of Learning*, 3(1), 57–66.
- Falloon, G. (2011). Making the connection: Moore's theory of transactional distance and its relevance to the use of a virtual classroom in postgraduate online teacher education. *Journal of Research on Technology in Education*, 43(3), 187–209. <https://doi.org/10.1080/15391523.2011.10782569>
- Gehring, E. F. (2020, June). Making large classes work for you and your students. In *2020 ASEE Virtual Annual Conference Content Access*. Virtual On line. <https://doi.org/10.18260/1-2-34944>
- Giosso, Y., Koutsouba, M., Lionarakis, A., & Skavantzios, K. (2009). Reconsidering Moore's Transactional Distance Theory. *European Journal of Open, Distance and E-Learning*.
- González-Calvo, G., Barba-Martín, R. A., Bores-García, D., & Hortigüela-Alcalá, D. (2021). The (virtual) teaching of physical education in times of pandemic. *European Physical Education Review*, 1356336X211031533.
- Gorsky, P., & Caspi, A. (2005). A critical analysis of transactional distance theory. *Quarterly Review of Distance Education*, 6(1), 1–11.
- Libarkin, J. C., & Kurdziel, J. (2002). Research methodologies in science education: Qualitative data. *Journal of Geoscience Education*, 50, 195–200.
- Machado, R. A., Bonan, P. R. F., Perez, D. E. D. C., Martelli, D. R. B., & Martelli-Júnior, H. (2020). I am having trouble keeping up with virtual teaching activities: Reflections in the COVID-19 era. *Clinics*, 75.
- Marzulina, L., Erlina, D., Holandyah, M., Harto, K., Desvitasari, D., & Angreini, D. (2021). English teachers' strategies in managing large classes: A case study. *Indonesian Research Journal in Education*, 5(2), 417–432.
- Michael, K. (2012). Virtual classroom: Reflections of online learning. *Campus-Wide Information Systems*, 29(3), 156–165.
- Moore, M. G. (2013). The theory of transactional distance. In *Handbook of distance education* (pp. 84–103). Routledge.

- Moore, M. (1993). Theory of transactional distance. In D. Keegan (Ed.), *Theoretical principles of distance education* (pp. 22–38). Routledge.
- Moore, M., & Kearsley, G. (1996). *Distance education: A systems review*. Wadsworth Publishing Company.
- Palloff, R. M., & Pratt, K. (2013). *Lessons from the virtual classroom: The realities of online teaching*. Wiley.
- Schutte, J. G. (1997). *Virtual teaching in higher education: The new intellectual superhighway or just another traffic jam?* Jerald G Schutte.
- Shenoy, V., Mahendra, S., & Vijay, N. (2020). COVID 19 lockdown technology adaption, teaching, learning, students' engagement and faculty experience. *Mukt Shabd Journal*, 9(4), 698–702.
- Solis, O. J., & Turner, W. D. (2016). Strategies for building positive student-instructor interactions in large classes. *The Journal of Effective Teaching*, 16(1), 36–51.
- Thatcher, A., & Mooney, G. (2008). Managing social activity and participation in large classes with mobile phone Technology. *International Journal of Interactive Mobile Technologies*, 2(3), 41–51.
- Ustati, R., & Hassan, S. S. S. (2013). Distance learning students' need: Evaluating interactions from Moore's theory of transactional distance. *Turkish Online Journal of Distance Education*, 14(2), 292–304.
- Yang, Z., & Liu, Q. (2007). Research and development of Web-based virtual online classroom. *Computers e5 Education*, 48, 171–184.

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