Measuring Digital Teaching Competence of Academic Staff in Public Universities in Uganda

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Abstract

The unanticipated lockdown of campuses of universities caused by COVID-19 disrupted education worldwide. Nonetheless, the benefit that came with the lockdowns is that, while previously interest in online learning was an emerging unique mode of delivery used by particular institutions, it expanded to virtually all universities leading to large-scale digitising of teaching and learning. However, in Uganda, public universities have been slow at digitising their education compared to private universities. This study measured the digital competence of academic staff in public universities. Digital competence of academic staff was anchored in the UNESCO (2018) ICT Competency Framework for Teachers and the TPACK model. Digital teaching competence was measured in terms of course design, technical competence, communication competence, and time management competence. Using the survey design, data were collected from a sample of 327 academic staff from a population of 2225 academic staff from four public universities in Uganda using a self-administered questionnaire. Descriptive statistics and structural equation modelling using partial least squares structural equation modelling (PLS-SEM) were used to analyse the data. Descriptive results revealed that; course design, technical, communication and time management competences were high. PLS-SEM indicated that the four measures appropriate measures of digital competence. It was concluded that academics in public universities have the digital competences necessary for effective digitalisation of education and technical, course design, course communication, and time management competences are appropriate measures for digital teaching competences. Therefore, the study recommended that managers of universities should take advantage of course design, technical, course communication and time management competences of academic staff to roll out digital education at a large scale. Also, scholars can use course design, technical, course communication and time management competences as measures of digital teaching competence.

Keywords: Communication, Competence, Course Design, Digital, Measures, Technical, Time Management

INTRODUCTION

The reality of the unprecedented COVID-19 that led to the shutdown of campuses of universities resulted in the need for digitising education. To ensure learning continuity, universities had to urgently and swiftly encourage their teachers to change their educational practices by adopting virtual methods (Basilotta-Gómez-Pablos et al., 2022). Before COVID-19, online teaching and learning using digital technologies was an upcoming practice considered a unique method of education delivery by certain institutions and departments, especially those involved in providing distance education (Masalimova et al., 2022). Nonetheless, following the COVID-19 pandemic, teachers in universities were generally required to be adaptive and reinvent themselves and their

teaching strategies by organising creative lessons for online engagement of students and finding unconventional techniques for remote evaluation of students' achievement. However, the challenge of digitising education was teachers' lack of competence to integrate digital tools and platforms into teaching and learning (Baroudi & Shaya, 2022).

Digital teaching competence denotes the ability to use digital tools to develop educational content, collaborate with students and colleagues, and communicate with them for educational purposes (Wang et al., 2021). It is concerned with the successful use of technology tools in order to access information and deliver it. Therefore, digital competences are the primary skills of information and communication technologies necessary for processing, storing, evaluating, producing, sharing, communicating, and cooperating virtually (Gümüş & Kukul, 2022). Badiozaman and Segar (2022) and Martin et al. (2019) indicate that digital teaching competences needed by teachers include technical, course design, course communication, and time management competences. Technical competence is the ability to employ information technology to accomplish various activities and establish several strategies for accomplishing the activities (Gupta, 2021). Technical competences are particular to the use of technological devices, which encompass technical knowledge and aptitude in the use of contemporary technology and the ability to support learners effectively (Reichert et al., 2020).

The competence of course design is about the ability to select content, choose the best methods for instruction, collaborate to improve the course, and carry out collective changes for improving teaching and learning (Smith et al., 2019). Course design competence helps to prescribe optimal methods of instruction for effective teaching (Baldwin et al., 2018). Course communication competence pertains to an individual's ability to convey information through effective and appropriate interaction (Kiessling & Fabry, 2021). With respect to the competence of course communication, it describes the ability to communicate using different online platforms, including email and sending announcements via the learning management system (Martin et al., 2019). For the competence of time management, it refers to the ability of an individual to organise, follow, and adjust time to changing circumstances (Aeon et al., 2021). Competent lecturers have adequate time-management skills that enable them to ensure that their other engagements do not interfere with their ability to deliver the course. Designing and planning digital course objectives, content, activities, and assessment appropriate for an online format takes time, hence higher-level time management (Martin et al., 2019).

While the digital competences of academic staff are imperative for digitising teaching and learning, empirical evidence suggests that they are low among academic staff in public universities in Uganda (Bwire et al., 2020; Bwire et al., 2020; Mugizi & Nagasha, 2023; Olema et al., 2020; Namutebi, 2021). Consequently, digitising education in Uganda's public universities has been problematic. The uptake of digital education delivery has been very slow in public universities compared to private universities, where some courses had been totally digitised even before COVID-19 (Kabahizi 2020). In a study done at Makerere University Business School in Uganda, Bada et al. (2020) reported that poor uptake of e-learning at the institution was because of conservative teachers who resisted the paradigm shift, a lack of online teaching, and students poor work evaluation skills. Bwire et al. (2020) in a study that included university teachers from five public universities in Uganda revealed that teachers' lack of skills to design online courses hindered effective digitalisation of education. Relatedly, Mugizi and Nagasha (2023) and Olema et al. (2020) in studies done at

Kyambogo University, reported that lecturers lacked ICT skills and had negative attitudes towards online learning, with many of them sticking to the face-to-face on campus approach. Analysing the Makerere University MUELE system, Namutebi (2021) also revealed lecturers lack of skills for course design. The study revealed that most courses, especially theoretical courses, were more inclined towards traditional methods of teaching and learning where textbooks were uploaded for students, yet MUELE had features supporting the design of authentic contexts like blogs, folders, files, and media collections. The above contextual evidence suggested that the digital competence of academic staff in public universities in Uganda Therefore, this study measured the digital competence of academic staff in public universities in Uganda with the following specific objectives:

1. To establish the digital technical competence of academic staff in public universities in Uganda.
2. To find out course design competence of academic staff in public universities in Uganda.
3. To determine course communication of academic staff in public universities in Uganda.
4. Establish time management competences of academic staff in public universities in Uganda.

LITERATURE REVIEW

Theoretical Review

Digital teaching competence is anchored in the UNESCO (2018) ICT Competency Framework for Teachers and the TPACK model (Mishra & Koehler, 2006). The UNESCO (2018) framework for teacher digital competences suggests three competences: technology knowledge acquisition (skills), technology knowledge deepening (using knowledge to add value or solve problems), and knowledge creation (innovate and create new knowledge) (Falloon, 2019). TPACK is a theoretical framework for comprehending the teacher knowledge needed for successful integration of technology (Dewi et al., 2022). The model provides three knowledge aspects: technological, pedagogical, and content knowledge. Technological knowledge is the teachers' ability to achieve various tasks using information technology and to put in place a variety of approaches to accomplishing given pedagogical and learning tasks. Pedagogical knowledge pertains to an understanding of what is needed to deliver specific content. It is about transforming the subject matter for teaching. Content knowledge concerns the teachers' familiarity with the material to be taught or learned (Koh, 2020). Badiozaman and Segar (2022) and Martin et al. (2019) measured four important digital teaching competences needed by teachers: technical, course design, course communication, and time management competences, which fit in the UNESCO ICT Competency Framework for Teachers and TPACK model. This study measured the four aspects of digital teaching competence, namely technical, course design, course communication, and time management competences.

Empirical Review

Scholars (Benali et al., 2018; Bwire et al., 2020; Cabero-Almenara et al., 2021; Çebi & Reisoğlu, 2020; Dias-Trindade et al., 2020; Fraile et al., 2018; Garzón-Artacho et al., 2021; Korucu et al., 2015; Mizova et al., 2021; Mugizi & Nagasha, 2023: Namutebi, 2021; Olema et al., 2020; Olofsson et al., 2020) have assessed to teachers digital teaching competences. However, the studies report varying levels of teachers' digital teaching competences. While only two studies (Benali et al., 2018; Korucu et al., 2015) reported that digital competences of the teachers were high, all the other studies reported low to moderate competence level. Nonetheless, all the studies (Bwire et al., 2020; Mugizi & Nagasha, 2023; Namutebi, 2021; Olema et al., 2020) done in the

context of Uganda educational institutions revealed that digital competences of teachers were low. Importantly, Mizova et al. (2021) reported that digital teaching competences increased with experience, while Olofsson et al. (2020) indicated that they depended on the local contextual conditions. Therefore, with the context changing since 2021 following the COVID-19 pandemic that increased academic staff's use of digital devices which suggests more experience with the devices, it was deemed necessary that this study further assess the digital competences of teachers in the context of universities in Uganda.

METHODOLOGY

Research Design and Sample

The study adopted a survey design because it enabled collecting of data from the respondents using a questionnaire. Survey research involves the use of a designed questionnaire to measure a given population's characteristics using statistical methods. The purpose of a survey is to obtain information describing the characteristics of a large sample relatively quickly (Creswell & Hirose, 2019). The sample constituted 327 academic staff from four public universities: Busiitema (245), Gulu (152), Makerere University (1492), and Mbarara University of Science and Technology (336). The sample from each university was obtained using proportionate sampling to ensure that the academic staff of each university was equally representative. The Table for sample determination by Krejcie and Morgan (1970) was the basis for determining the sample size. The sample size from each university was reached using proportionate sampling, ensuring that the staff of each university was equally represented. Using simple random sampling enabled the control of data bias and the generalisation of the findings. The sample was obtained from the universities using simple random sampling using a sampling frame. This provided an equal chance for all lecturers to participate in the study, hence collecting the data necessary for generalizable findings.

Instrument

The data collection instrument was a self-administered questionnaire developed based on an earlier instrument by Martin et al. (2019). Martin et al. operationalized digital teaching competence in terms of technical, course design, course communication, and time management competences. Prior to the collection of data, face validation was used to validate the instrument at a preliminary level. The indicators for the different measures were scaled using the five-point Likert scale, with one as the minimum (worst-case scenario) and five as the maximum (best-case scenario). The anchors used were 1 = strongly disagreed, 2 = disagreed, 3 = not sure, 4 = agreed, and 5 = strongly agreed.

Data Analysis

The validities of the measures, namely technical, course design, course communication, and time management competences, were first tested using convergent and discriminant validity to confirm whether the indicators of the measures were internally consistent and whether the measures were independent. Reliability tests were done using Cronbach's alpha and composite reliability. Composite reliability was carried out in addition to Cronbach's alpha; the latter is very sensitive and assumes that the characteristics of the indicators should be the same across the population. Composite reliability is accommodative because it takes external characteristics into account and enables a greater number of indicators to achieve reliability (Hair Jr. et al., 2021). To find out the level of digital competence of academic staff, descriptive statistics, particularly the means, were calculated. Subsequently, Factor Analysis was carried out using SmartPLS for partial least squares structural equation modelling (PLS-SEM) to

develop a model showing appropriate indicators measuring the digital competence constructs.

RESULTS

Demographic Characteristics

The demographic characteristic results of the study participants are on sex, age, education level, and working experience. The demographic results are presented in Table 1.

Table 1: Participants Demographic Profiles

Profiles	Categories	Frequencies	Percent
Sex	Male	224	68.5
	Female	103	31.5
	Total	327	100.0
Age Group	Up to 39 years	132	40.4
	40- 49	140	42.8
	50 and above	55	16.8
	Total	327	100.0
Education Level	Bachelor's degree	12	3.7
	Masters' Degree	195	59.6
	PhD	120	36.7
Working Experience in Years	Less than one year	39	11.9
	1 but less than 5 years	97	29.7
	5 but less than 10 years	87	26.6
	More than 10 years	104	31.8
	Total	327	100.0

The data in Table 1 on sex revealed that males (68.5%) were the majority, while females were 31.5%. The results on age showed that the larger percentage (42.8%) was of those between 40 and 49 years, followed by those who were up to 39 years (40.4%), and the least percentage (16.8%) was of those who were 50 years and above. With respect to education level, the larger percentage (59.6%) had master's degrees, 36.7% had PhDs, and 3.7% had bachelor's degrees. Concerning working experiences, 31.8% had worked for more than 10 years, followed by 29.7% with work experience of one but less than five years, 26.6% had worked for five but less than 10 years, and the least group, 11.9%, had worked for less than one year. Overall, these results suggested that the academic staff involved in the study were of varied demographic categories.

Measurement Models

To establish how the academic staff rated their digital teaching competence, descriptive statistics, specifically the means, were calculated and measurement models developed. The measurement models confirmed their validity and reliability. Validity tests included Average Variance Extracted (AVE) for convergent validity and Heterotrait Monotrait (HTMT) Discriminant validity, while reliability included Chronbach's alpha and composite reliability. Further, collinearity was tested to indicate independence of the measures. Table 1 presents descriptive results and the validities in terms of AVE and Heterotrait Monotrait (HTMT) Discriminant validity, while Table 2 presents Cronbach's alpha (α), composite reliability (CR), and collinearity values.

Table 2: Means, AVE and Heterotrait Monotrait (HTMT) Discriminant Validity assessment

Measures	Means	AVE	DCDC	DDTC	DCCC	DTMC
DCDC	3.78	0.560				
DDTC	4.09	0.515	0.694			
DCCC	3.96	0.563	0.672	0.594		
DTMC	4.06	0.573	0.734	0.424	0.664	
DTC	3.97					

Abbreviations: *CDC = Course Design Competence, DDTC= Digital Technical Competence, CCC = Course Communication Competence, DTMC = Time Management Competence, DTC = Digital Teaching Competence.*

The results in Table 2 revealed that the lecturers indicated that their course design (mean = 378), digital technical (mean = 4.09), course communication (mean = 3.96), and time management (mean = 4.06) competences were high. This was because, based on the five-point Likert scale used (1 = strongly disagreed, 2 = disagreed, 3 = not sure, 4 = agreed, and 5 = strongly disagreed), the means were close to code 4, which implied agreement, hence the high rating. Overall, teachers indicated that their digital teaching competences (mean 3.97) were high. The AVE values in Table 2 for convergent validity revealed that the different constructs assessed measured the variable of digital teaching competence. All EVE values were above the minimum of 0.5 (Hair Jr. et al., 2021), indicating that the various indictors in the questionnaire (Appendix 1) measured the constructs. The Heterotrait-Monotrait (HTMT) ratio of correlations examined discriminant validity to establish whether aspects of the variable studied were independent, hence various descriptions of it. The HTMT ratio is a reflective tool that reveals whether measures in a model are independent. The HTMT ratios of correlation (Table 2) were below 0.90, which is the threshold (Roemer et al., 2021), suggesting that the constructs were independent. Therefore, the measures, namely course design competence, digital technical competence, course communication competence, and time management competence, describe digital teaching competence.

Table 3: Reliability and Collinearity Values

Digital Teaching Competences	α	CR	VIF
Course Communication Competence	0.804	0.810	1.627
Course Design Competence	0.805	0.830	1.508
Digital Technical Competence	0.738	0.749	1.523
Time Management Competence	0.810	0.818	1.606

The reliability values in Table 3 indicate both Cronbach's alpha (α) and composite reliability (CR). The values were higher than the minimum of 0.70, suggesting that the indicators of the measures (constructs) of the variable of digital teaching competence were reliable. Considering both Chronbach's alpha and composite reliability were premised on the assumption that Chronbach's alpha is very sensitive because it assumes that the traits of the indictors are similar, which reduces reliability levels, on its part, composite reliability is highly accommodative because it tolerates external characteristics, which most likely increase the number of indicators that become reliable (Hair Jr. et al., 2021). Therefore, the measures of digital teaching competence

were reliable. The test results (Table 3) also revealed that there was an insignificant correlation (Collinearity) between the constructs as the variance inflation factor (VIF) values, the standard gauge for assessing collinearity, were less than 5 (Marcoulides & Raykov, 2019). This implied that each construct measured the variable independently.

Structural model for Digital Teaching Competence

Structural equation modelling was done in order to determine the measures of digital teaching competence. Figure 1 shows the appropriate indicators of the constructs measuring digital teaching competence.

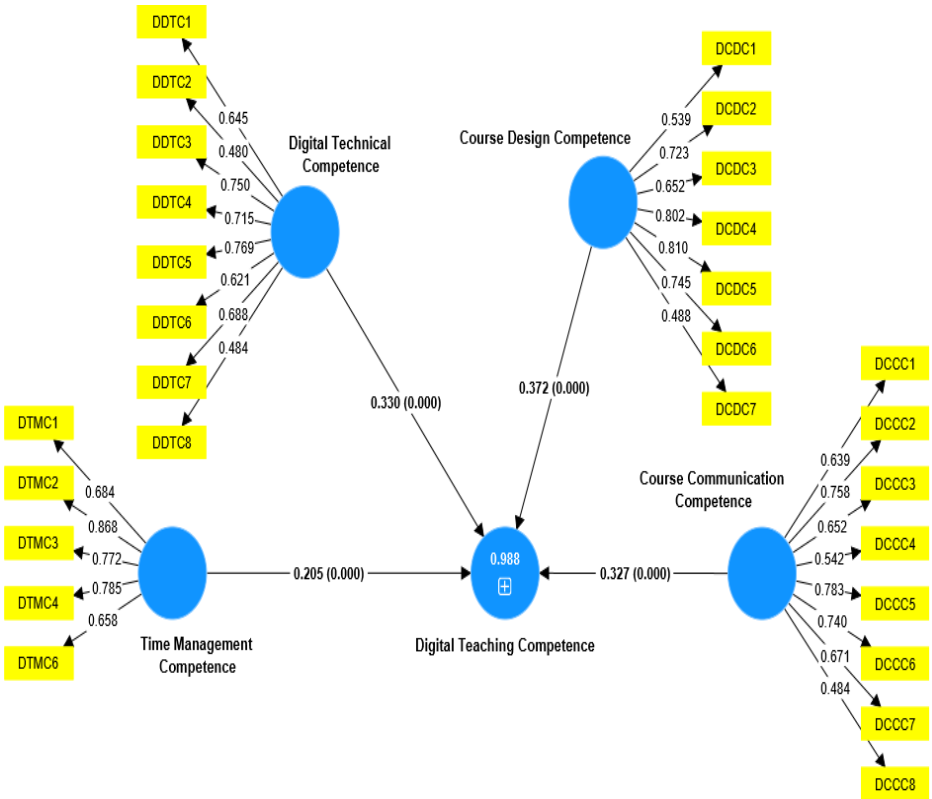

Figure 1: Digital Teaching Competence Structural Model

The structural model (Figure 1) for digital teaching competence reveals that for the constructs of course design competence, digital technical competence, and course communication competence, all the indicators were retained. However, for time management competence, indicator five (DTMC 5) was dropped. The indicators maintained were thus true measures of the constructs. Therefore, the different constructs were appropriate measures, and the constructs explain digital teaching competence.

DISCUSSION

The results revealed that digital teaching competences of academic staff were high. This was consistent with Benali et al. (2018) and Korucu et al. (2015) who reported that digital teaching competences of the teachers were high. Nonetheless, the finding was inconsistent with the findings of most scholars (Bwire et al., 2020; Cabero-Almenara et al., 2021; Çebi & Reisoğlu, 2020; Dias-Trindade et al., 2020; Fraile et al.,

2018; Garzón-Artacho et al., 2021; Mizova et al., 2021; Mugizi & Nagasha, 2023: Namutebi, 2021; Olema et al., 2020; Olofsson et al., 2020) including those whose studies were done in Ugnandan educational institutions who indicated that the teaching competences of the teachers were low to moderate. For instance, Bwire et al. (2020) and Namutebi (2021) in the context of Uganda reported that academic staff lacked skills to design online courses which hindered effective digitalisation of education. Similarly, Mugizi and Nagasha (2023) and Olema et al. (2020) revealed that lecturers lacked ICT skills. However, it should be noted that academic staff reported high digital teaching competences because they were involved with the use digital devices for some time that is since the outbreak of Covid-19. Therefore, it was not a surprise that the digital competences of academic staff had highly improved. With respect to the measures of digital teaching competence, the findings revealed that the four competences of technical, course design, course communication, and time management accurately described or measured digital teaching competence. This finding is consistent with Badiozaman and Segar (2022) and Martin et al. (2019) who indicated that these were measures the measures of digital teaching competence. Therefore, course design, technical, course communication, and time management are the digital teaching competences for academic staff.

CONCLUSION

The study concluded that academics in public universities have the digital competences necessary for effective digitalization of education, and technical, course design, course communication, and time management competences are appropriate measures of digital teaching competences. Digital course design competence involves the ability to carry out online course orientation, organise instructional resources into modules or units that may be delivered online, create online quantifiable learning objectives, and create activities that give students the opportunity to interact online. Digital course design competence also involves the capacity to create instructional content, use different teaching methods, and create online assignments and tests. Digital technical competence includes the capacity to effectively use the hardware tools, make presentations, effectively use software tools, solve the problems encountered while in online classes personally, and easily navigate the online teaching hardware by successfully creating, uploading, and delivering online lectures. Also, digital technical competence includes the capability to carry out basic computer operations, use online collaborative tools, and share open educational resources with students.

With respect to digital course communication, this encompasses the ability to communicate with students, create and moderate discussions, use synchronous and asynchronous communication tools, provide prompt responses, share open educational resources, communicate behaviour expectations, and ensure compliance regarding academic online integrity. Digital time management competence involves the ability to set aside time to organise the course for online classes prior to delivery, schedule a timetable to facilitate the online course, and teach the required content for the session in the scheduled time. Digital time management competence also involves managing the time spent conducting online lectures, providing fast feedback after submission of the assignment, and allocating time to self to train and learn new strategies for online lectures.

RECOMMENDATIONS

The conclusions above to the effect that academics in public universities have the digital competences necessary for effective digitalisation of education led to the recommendation that managers of universities should take advantage of the course design, technical, course communication, and time management competences of

academic staff to roll out digital education at a large scale. In addition, university managers should ensure that from time to time they provide training to academic staff so that they refresh their digital teaching competences and gain new knowledge and skills necessary for conducting online classes. This is because online technologies continue to evolve and develop, sometimes making old knowledge less effective or absolute. Further, the study recommended that scholars can use course design, technical, course communication, and time management competences as measures of digital teaching competences.

Limitations

The findings indicate the level of digital competence of academic staff and its measures. However, gaps that can be addressed by future scholars emerged. For example, the study considered academics from public universities, which are better funded because of government support. Other scholars should extend the study to private universities and other tertiary institutions. In addition, the study adopted only a quantitative approach, limiting in-depth analysis. Future researchers should include a mixed or qualitative approach for exploratory analysis.

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