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Technology Educators Pedagogical Adjustment in the Post-pandemic Era: A Case Study of Lecturers in the Oil-rich Region, Nigeria

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Abstract

During the COVID-19 pandemic, a lot of lecturers switched to teaching online. There is reason to believe that educators' pedagogy and teaching philosophies would have undergone a significant transformation. This survey, however, was created to examine the pedagogical and philosophical adjustments technology educators made in reaction to COVID-19. Eight technology educators were subjected to in-depth interviews to learn more about their teaching styles and how they handled the shift to online learning. Thematic and pattern analysis was performed on interview transcripts. Instructors made many changes during the changeover, some general and others specific. Based on the results of the interview, indicators point to several possible explanations for their decisions, such as the extent to which the course structure provided change unnecessary, the influence of the instructors' existing skill set, their desire to preserve the integrity of grades, a set of questions to help lecturers restructure their curricula, and their understanding of the bounds of technology-based education pedagogy. These interviews help us understand how technology educators were affected by the sudden shift to online instruction. To meet the demands of COVID-19, technology education evolved quickly. However, constant adaptation is required to further improve pedagogy.

1. Introduction

The COVID-19 pandemic necessitated many higher education institutions to switch to online instruction suddenly and forcibly. This caused significant disruption to the academic calendar as teachers had to deal with all the strains associated with a global epidemic at the same time as teaching moved online (Huber & Helm, 2020). Going forward, academicians must reconsider their methods of delivery to resume their work in academia, research, and

development (Hawk et al., 2020; Theoret & Ming, 2020). Existing research indicates that COVID-19 has affected education around the world, in terms of the obstacles, limitations, and issues that governments, institutions, and stakeholders have to deal with (Lucas, Nelson, & Sims, 2020; Zhang, Wang, Yang, & Wang, 2020). Other articles like that of (Ferdig, Baumgartner, Hartshorne, Kaplan-Rakowski, & Mouza, 2020) concentrate on remote teaching experiences, innovations, and methods as well as explanations of how institutions and stakeholders adjusted to the new environment brought about by the COVID-19 pandemic. The differences in technology and Internet access, housing insecurity, parental job loss, family commitments, and the potential need to take on an unanticipated job during the period made students more vulnerable than they had previously been to instructors (Paris & Alim, 2017). The abrupt destabilization of higher education and the emergency transfer online, while difficult, has provided a chance for reflection, introspection, collaboration, and reinvention of instructors' approaches to teaching and students. (Whiteside, Kane, Aljohani, Alsamman, & Pourmand, 2020), hypothesized in a preliminary focus group that the pandemic served as a vehicle for "radical innovation," opening doors for empathy, cooperation, and support. This is further supported by a growing body of research documenting modifications to instructional methods, as well as blogs and reviews that offer guidance and best practices for technology-based education (Balakrishnan & Long, 2020; Jenkins et al., 2021). These publications largely emphasize course content and student outcomes, much like the majority of the crisis teaching literature written before the pandemic, which concentrated on teaching in the wake of acute traumas like school shootings, natural disasters, and terrorist attacks (DeBacher & Harris-Moore, 2016; Gershenson & Tekin, 2018; Turunen, Haravuori, Punamäki, Suomalainen, & Marttunen, 2014).

In light of newly available data, discussions on how the pandemic affected teachers' perspectives on and approaches to teaching and learning as well as their relationships with their students are quickly evolving. In trade publications, articles explored issues such as the moral dilemmas teachers faced when attempting to assess students properly while also helping those who were struggling (Rapanta, Botturi, Goodyear, Guàrdia, & Koole, 2020) and choosing whether to switch to online synchronous or asynchronous formats (Guo, 2020; Johns & Mills, 2021; Yulia, 2020). (Johnson, Veletsianos, & Seaman, 2020; Kim, Yu, Park, Ha, & Baek, 2021; Sepulveda-Escobar & Morrison, 2020) are a few more papers that have been published regarding the experiences of teachers during COVID-19 and how they have changed their teaching perspectives. (Shenoy, Mahendra, & Vijay, 2020), the research goal was to comprehend how technology is used in teaching and learning, student participation, and staff experiences in virtual classrooms in India during the COVID-19 lockdown. The data for this study was gathered from faculty members affiliated with higher education institutions in Bangalore who teach courses like PGDM, M.B.A., M.Com, M.C.A., etc. using inductive reasoning and qualitative research techniques. According to the study's findings, teaching members used new technologies during the lockdown, and students participated in a variety of online learning activities. However, teachers and students were questioned regarding the online shift in teaching and learning with an emphasis on assessment strategies and practical instruction during and after the period (Asgari et al., 2021). They paid little attention to investigating how instructors justified their course changes or even what changes were implemented; instead, their survey focused on teachers' challenges with technology resulting in more than half of the students showing a lack of engagement in class and difficulties in maintaining their focus among others. The present study seeks to add a detailed qualitative analysis of instructors' experiences from interviews conducted right after the COVID period to this existing research with a focus on industrial instructors who must adhere to specific institutional requirements such as accreditation standards and carefully designed course sequences.

Over the years, other disasters (such as earthquakes and hurricanes) have caused interruptions to academic continuity, but not to the same degree as COVID-19, which has impacted colleges all across the world (Gelles, Lord, Hoople, Chen, & Mejia, 2020). Their interviews with students during the pandemic are consistent with the literature on other Emergency Remote Teaching (ERT) situations, illuminating three challenges that both students and teachers had to overcome: alterations in workload, unfavorable learning environments, and communication problems brought on by asynchronous communication and a lack of technology access. In light of these, (Asgari et al., 2021; Gelles et al., 2020; Means & Neisler, 2021) believe that there is a greater need for student housing as a result of stress brought on by financial difficulties, moving, family COVID-19 infections, burnout, and mental health problems. Due to these difficulties, teachers sought instructional modifications and adjustments, frequently on the spur of the moment and utilizing unofficial social networks to fill in knowledge gaps. According to the interviews with students conducted by (Gelles et al., 2020; Marquez & Garcia, 2021), instructors made adjustments like improving communication, reducing workload, assigning homework during class, granting extensions without much scrutiny, and generally speaking increasing their efforts to teach and communicate effectively using a variety of methods to effectively adapt to the new online learning platform. This was supported by the investigation of (Ahmed et al., 2021; A. K. Hall et al., 2020; Nguyen & Kieuthi, 2020) who discovered that about a greater percentage of educators changed their criteria or assessment procedures in some way during COVID. According to (Sepulveda-Escobar & Morrison, 2020) these adjustments affected instructors' instructional strategies in response to the pandemic without any corresponding change in their teaching and learning approaches.

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It is possible to think that there will be no straightforward or predictable correlation between the pandemic and pedagogical or philosophical adjustment. The majority of pandemic pedagogical studies blur the distinction between methodology and teaching philosophy and focus on the specific adjustments teachers made to the crisis. This study uses teachers' perspectives of impromptu online instruction during the COVID era to examine pedagogical and conceptual changes. While it's critical to record the pedagogical and philosophical changes professors made, it's just as crucial to take into account any modifications that might have been avoided if they had been thought unwanted or unneeded. By analyzing these problems in the context of instructors who have a vocational background, we hope to gain a deeper understanding of how preconceived notions and beliefs about the nature of engineering education might obstruct more fundamental philosophical shifts, impeding effective course adaptation and student accommodations both inside and outside of crisis.

The following research questions have served as a guide for this study:

1. What are the changes technology educators made to their pedagogical practices during the COVID-19 pandemic period?
2. What were the perceived rationales provided for the change or otherwise?

2. Literature Review

2.1 Challenges Associated with ERT in Technology-Based Education

Switching to emergency remote teaching during the COVID-19 period was not without challenges. (Sepulveda-Escobar & Morrison, 2020), conducted research on online teaching placement during the COVID-19 pandemic in Chile. Findings indicate that some of the things that had the most effects on the participants' learning process were the rapid change in environment and the lack of direct interaction with other learners. Despite the difficulties, student instructors expressed hope that this once-in-a-lifetime opportunity will at least somewhat benefit their teacher preparation and future jobs. (Bisht, Jasola, & Bisht, 2020), assessed the students' perspective on the acceptability and challenges of online higher education in the era of COVID-19.

The Authors uncovered difficulties associated with online learning, such as Internet access and student-teacher relations. (Mseleku, 2020) conducted a literature review of E-learning and E-teaching in the era of the Covid-19 Pandemic the author revealed that being unable to access or use online learning and teaching resources; having trouble adjusting, especially for students from low-income families and those who live in remote locations; and experiencing related stress, sadness, and anxiety were obstacles against emergency remote teaching during the Covid-19 period. (Aboagye, 2021), investigated the challenges of tutors at colleges of education in Ghana in transitioning from face-to-face to online instruction in the COVID-19 era. The findings show how student factors, learning management systems, network issues, and pedagogical issues prevent tutors from successfully delivering online. The author further suggested that using a hybrid approach can help tutors make the shift more painless and successful. (Sunita, 2020), examines COVID-19's effects on education from the perspectives of instructors, students, and parents. Surveys and virtual focus groups with 150 respondents from Trinidad and Tobago, as well as migrants from Venezuela and Cuba, were used to gather the data. According to the findings, the education sector has become increasingly dependent on technology to maintain online learning throughout the pandemic. However, the author observed that online learning has been demonstrated to be hampered by inadequate infrastructure, including network, power, accessibility, and availability concerns, which are further exacerbated by a lack of digital literacy.

The study highlights the negative consequences of COVID-19 on the education industry and the necessity for all educational institutions, teachers, and students to accept technology and enhance their digital abilities in line with the new global trends and realities in education Despite the best efforts of institutions, teachers, and students to adapt to the sudden closure of physical facilities and the ensuing reliance on blended learning, technical, pedagogical, and resource unpreparedness cloud the potential and prospects of e-learning. Participants' data analysis uncovered significant potential barriers, including those that are personal, learning management-related, technical, social, and institutional. Their lack of basic knowledge and experience in ERT was the main personal barrier that all the participants encountered. The teachers also lack the necessary educational expertise for the new medium. For a variety of factors, from a lack of infrastructure to a lack of training, desire, and capacity to adapt to the new technology, it cannot be argued that the teachers' current teaching and learning experiences are particularly beneficial. This conclusion is also supported by recent studies. According to (Englund, Olofsson, & Price, 2017) research, less experienced teachers were less willing to acclimate to change than their less experienced counterparts and (Vickers, 2017), found that one of the biggest obstacles is teachers' unfamiliarity with teaching resources and software. (Sithole, Mupinga, Kibirige, Manyanga, & Bucklein, 2019) pointed out that the challenge of maintaining class control and student engagement was another main ERT transition hurdle. Knowing for sure that the person on the other end is the student registered in the class in a video-off digital environment is still a challenge for online educators. Although it is possible to learn just as successfully online as in person, it has been discovered from the students' perspective that self-motivated learners are more likely to succeed in the ERT system (Muuro, Wagacha, Kihoro, & Oboko, 2014). The largest challenge, according to Jones (2015), is internet

connectivity. Most teachers and students, especially those who reside in rural areas as they did in other distant regions of the world, were impacted by the necessity of having access to high-speed internet connections for successful sessions. Teachers reading students' body language and making eye contact are important aspects of a regular classroom that are often lacking in ERT. As (Muuro et al., 2014) stated, "Online education can never be the substitute for a traditional classroom because, in online classes, one-to-one relationships become a little bit weaker." Teachers expressed their frustration with their inability to anticipate their students' immediate needs and actions, especially when video resources became difficult. Low levels of concentration and a lack of association can impede learning. The lack of discussion boards in a constrained and poorly designed and managed online system disadvantages students and distances professors.

3. Methodology

3.1 Participants

In this study, eight individuals were interviewed to examine how technology educators adjusted pedagogically during the COVID-19 pandemic using thematic analysis on industrial instructors from 12 colleges of education in the oil-rich region of Nigeria comprising Akwa Ibom, Bayelsa, Cross River, Delta, Edo and Rivers State. Convenience sampling and a snowballing approach were used to enlist participants. Participants were chosen based on two factors i) they were industrial technical educators, and ii) they were involved in teaching technical courses during the pandemic period. However, eight participants fit these criteria. The eight interviewees taught a range of introductory, intermediate, and advanced industrial technical courses (see Table 1). To conceal their information, gender-neutral pronouns and pseudonyms are utilized in every instance. To maintain the confidentiality of the interviewees, other work responsibilities and personal traits are collectively mentioned. The group consisted of seven males and one female with ages ranging from 27 to 56. Three participants representing 37.5% had 25 years of teaching experience while the others have taught for above seven years. All of them are computer literate and have all the gadgets to support their online teaching. Five participants representing 62.5% held a Ph. D. and the other three had MSc. degrees. Based on the characteristics of the participants, they are considered fit to respond to the interview. The eight participants worked at twelve educational institutions that offered industrial technical education programs to 76 to 102 Nigeria Certificate of Education, (Technical) NCE (T) students. The majority of the student population at this university at the time was and is Black African. 32% of them remain in semi-urban and rural settings while the remaining 68% go to metropolitan areas. However, there was wide and consistent access to internet resources. In the second semester, from June to August 2020, colleges of education began using remote teaching and learning (Ten weeks). Through online education specialists, colleges received optional "crash course" instruction before their semester-long meetings. Academic members have access to institutional assistance in the form of extended counseling services for students, IT call hours, and grants for small technology expenditures. Students might choose the pass/fail (P/F) grading option after getting their final course grades.

Table 1 *Participant demography and courses taught during the COVID-19 period*

Participants	Qualification	Rank	Specialization	Course taught
Participant 1	Ph.D	CL	BT	Maintenance work on roof and ceiling (including routine check) to 15 years three students
Participant 2	Ph.D	CL	BT	Produce assembly drawings from exploded views of machine components and vice visa to 18 year three students
Participant 3	Ph.D	PL	EET	Power generation, transmission and distribution, transmission lines, Tariffs, power factor and correction to 12-year-old students.
Participant 4	M.S	SL	BT	Planning, organization and preparation of the site for simple building projects for 22-year-two students
Participant 5	Ph.D	PL	EET	Thermionic Emission Process (Bipolar, transistors, FET, Thermistor, Semiconductor diodes) to 24 year two students
Participant 6	Ph.D	SL	MT	Layout of a hydraulic braking system for 28 year two students
Participant 7	M.Sc	LII	WWT	Layout of a hydraulic braking system for 28 year two students
Participant 8	M.Sc	LI	WWT	School workshop design (units and integrated) for 15 year three students

Notation: CL= Chief Lecturer, PL=Principal Lecturer, SL=Senior Lecturer, LI= Lecturer I, LII=Lecturer II, BT=Building Technology, EET=Electrical/Electronic Technology, MT=Mechanical Technology, WWT=Woodwork Technology, Ph.D=Doctor of Philosophy & MSc=Master of Science.

3.2 Data Collection

Interviews with participants took place within two months (January and February 2021). Semi-structured interviews were performed through Zoom using an interview guide. Audio and video recordings of each interview were made. The interviewing procedure was guided by data from the demographic survey, which was also utilized to create Table 1. The COVID-19 pandemic's effects on teachers' work-life balance, instructional perspective, approach to grading, course adjustments, and feeling of purpose as educators were all covered in the interview questions that related to the instructors' move online over the semester and detailed notes were taken after every interview. The interview guide was somewhat modified after the first 27 interviews in the larger study were finished to codify the ordering changes, wording tweaks, and follow-ups we had discovered to be helpful when talking about teaching philosophy. Many qualitative approaches, such as grounded theory, which encourages regular updating of the interview guide in light of fresh facts and hypotheses, are congruent with this practice (Barrett & Twycross, 2018; Carter & Henderson, 2005; Hollstein, 2011). Two participants in industrial education used the updated interview guide, but it did not have any effect on the way the analysis was done. Before switching to a combination of independent or paired interviews when time permitted as advised by the researchers, each early interview was performed by two researchers to get a sense of the four investigators' styles and interests recommended by (Bachiochi & Weiner, 2004; Flick, 2017; Sapsford & Jupp, 1996). Two researchers conducted three of the interviews mentioned in this study, whereas one researcher did three of them.

3.3 Data Analysis

For each scale, confirmatory factor analysis (CFA) was first carried out. To run the models, a covariance matrix was produced. We used the Tucker-Lewis index (TLI) and comparative fit index (CFI) to evaluate the suitability of measurement models with few degrees of freedom (Kenny, Kaniskan, & McCoach, 2015). These indices indicate a satisfactory match when values are around 0.90 or higher. Additionally, factor loadings that were sufficient when above 0.40 were examined. The Cronbach's alpha test was used to evaluate internal consistency. Second, the variables' means, standard deviations, and correlations were computed. We created a structural equation model (SEM) for the entire sample. The original scale items were used as the observed variables, and SEM models were performed using the covariance matrix created for the CFA. We used the root mean square error of approximation (RMSEA) value, which is an indicator of good fit when it is below 0.05, although an RMSEA value of approximately 0.08 or less is also acceptable (Byrne, 2010), the CFI and TLI values, already mentioned, and the 2 per degree of freedom (2 /df), which indicates a good fit when the value is equal to or below 3 (Kline et al., 2005). To determine whether the estimated effects were the same for male and female teachers, a multiple-group model was evaluated. In order to do this, modifications in fit between the configured, weak invariance, and structural models were examined to test measurement invariance. The assumption of invariance across models was deemed to be tenable if $\Delta CFI < 0.015$ and $\Delta RMSEA < 0.015$, as suggested by (Miyamoto et al., 2007).

4. Results

Eight primary themes emerged from our analysis of the interviews, showing both the "what" and the "why" of course adaptation (Table 2). A CFA with acceptable/good TLI and CFI values and factor loadings well above 0.40 confirmed the adequateness of the measures used. Particular attention was given to the general accommodation, on which the factor loadings ranged from 0.66 to 0.72, and the TLI and CFI were 0.76 and 0.79, respectively, and to the adapted steady foundation scale, on which the factor loadings ranged from 0.50 to 0.67, and the TLI and CFI were 0.82 and 0.88, respectively.

Next, all constructs were included as latent variables in SEM models. With all the relations the first model had a TLI value that was marginally below acceptable, with a $\chi 2$ (600) = 1694.312, p <0.000, TLI = 0.678, CFI = 0.700, and RMSEA = 0.039. Therefore, after analyzing the modification indices, we ultimately conducted a second model (Model 2) in which there was a correlation between items 3 and 4 of the Teaching Principles scale, items 1 and 2 of the General Accommodation, and items 6 and 8 of the Protecting the Validity of Grades in the Field. With a $\chi 2$ (736) = 1378.403, p < 0.000, TLI = 0.782, CFI = 0.650, and RMSEA = 0.047, this model fit the data reasonably well. Table 4 shows estimates for both significant and non-significant paths. Since some of the pathways were not significant, non-significant linkages were eliminated in a third model. With χ (791) = 1568.690, P < 0.000, TLI = 0.871, CFI = 0.863, and RMSEA = 0.046, this model likewise fit the data well. To further test this relationship, a fourth model with identical indices of fit as the previous one was designed using teaching concepts that predicted a stable foundation. This path's beta value was substantial and marginally lower than the inverted path's (0.39 vs 0.43).

Table 2 *A sample codebook displaying pertinent themes by each study question and a sample code for each theme*

Research questions	Theme	Example code	Code definition
Q1.	1. General accommodation	Relaxing grading	A situation where the participant reported adjusting project due dates as stated guidelines
	2. Individual accommodation	Reaching out to students	Cases where participants approached particular students rather than the entire class.
	3. Maintaining	Changes avoided	Cases in which the participant's expectations specifically refused to alter their class or shied away from offering adjustment
	4. While guiding progress teaching principles were hardly reviewed	Temporary circumstance	According to this belief, the pandemic was a passing phenomenon, necessitating only minor adjustments to the way that students were taught
	5. Steady foundation		
Q2.		Did not require making significant changes	The pedagogical approach was already effective, and the switch to online learning went rather well.
	6. Skills with instructional technology	Online teaching learning curve	The degree of expertise in online education at the start of the outbreak
	7. Protecting the validity of grades in the field	Sense of obligation to the field	Situations in which the participant felt response to the technical community.
	8. Perceived scope of vocational pedagogy	Desire to keep a professional relationship	Even throughout the outbreak, the respondents made it clear that they were experts.

4.1 Changes Technology Educators Made to Their Pedagogical Practices

During the classes students who return home to poor Internet access, unanticipated obligations, and duty to "be as empathetic as possible with the students because of probable things that are going on at home" However, to head off impending problems or undisclosed student troubles, instructors developed generalized, class-wide policies and implemented them proactively. These changes were frequently minor increasing communication, moving a few deadlines around, providing general assignment flexibility, and/or transferring content into an online repository. Sometimes more time-consuming modifications were made, such as adding fresh COVID-19-related information, making a live class completely asynchronous, or creating fresh exercises or evaluation methods.

As problems arose, which often only affected certain students, special accommodation was provided on a case-by-case basis. These modifications were more frequent than more general ones; in fact, every lecturer provided some kind of accommodation in response to a student's demands. When lecturers were unable to handle issues on their own, they enlisted the assistance of college resources to help. There was a range of individualized adaptations and adjustments, much like with the more general adaptations. Extensions to deadlines or sporadic one-on-one meetings were minor modifications, and outreach efforts were restricted to emails. Referrals to college services and assignments that were canceled are two examples of more moderate adjustments. Extensive attempts to re-engage students were made at the other end of the spectrum, including calling them on their cell phones (whose identities were discovered through the college database) and urging them to take a pass or fail grade. Many of the students lecturers spoke with had experienced student difficulty, some of which was extremely severe. As the nature of the pupils' issues became clear, customized techniques were employed to assist them. The

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majority of the time, however, these adjustments were not accompanied by remarks that alluded to a more profound change in teaching philosophy.

The extent of concessions that lecturers were willing to pursue had limits. Several interviewees voiced discomfort and concern over expectations, effort, and perceived course difficulty being compromised. A student shouldn't start working if they haven't demonstrated that they can fulfill the minimum criteria, according to lecturers. Interviewees were concerned that lowering requirements would make free-rider issues worse because group projects were so common in their course and worried about how it might affect students' capacity to compete in the employment market. Not every interviewee voiced caution about the pass or fail option or lowered expectations. Grading was somewhat altered. For instance, where students required a certain level of a pass but were just close to it, some lecturers gave them the nearest pass grade. One lecturer says "I was kind of slack on grading, less strict on grading." The potential professional consequences for their students and grades seemed to be less important to the instructors in both of these situations.

Table 3 *Cronbach's alpha, mean, standard deviation, and correlation matrix*

	Themes	α	x	SD	1	2	3	4	5	6	7
1.	Theme 1	0.73	0.38	0.78							
2.	Theme 2	0.76	0.33	0.61	-.42***						
3.	Theme 3	0.71	0.29	0.56	.51***	-.28***					
4.	Theme 4	0.70	0.30	0.63	-.38***	-.36***	.36***				
5.	Theme 5	0.74	0.41	0.58	-.41***	.40***	.29***	.36***			
6.	Theme 6	0.77	0.27	0.49	-.35***	.28***	.38***	.27***	.29***		
7.	Theme 7	0.79	4.20	0.69	.50***	-.53***	-.19***	.33***	-.43***	.24***	
8.	Theme 8	0.72	0.36	0.56	.48***	.37***	.38***	-.28***	.30***	.28***	.21***

***p < .001, α = Cronbach's alpha, x = Mean, SD = Standard Deviation ***p
Theme 1 = General accommodation, Theme 2 = Individual accommodation, Theme 3 = Maintaining, Theme 4 = Teaching principles, Theme 5 = Steady foundation, Theme 6 = Skills with instructional technology, Theme 7 = Protecting the validity of grades in the field, Theme 8 = Perceived scope of vocational pedagogy

Table 4 *Results of SEM analysis, model 2*

	B	*SE*	*B*
General accommodation	0.52	0.06	-28***
Individual accommodation	-0.22	0.09	-37***
Individual accommodation	0.35	0.03	-17***
Maintaining	0.27	0.05	.36***
Maintaining	0.11	0.07	.16***
Maintaining	0.48	0.03	.29***
Teaching principles	0.25	0.02	.07***
Teaching principles	0.33	0.10	.16***
Teaching principles	-0.24	0.08	.31***
Teaching principles	-0.41	0.04	-13***
Steady foundation	0.50	0.01	.33***
Steady foundation	-0.28	0.11	-36***
Steady foundation	-0.11	0.05	.26***
Steady foundation	-0.17	0.09	.39***
Steady foundation	-0.32	0.06	-04***
Skills with instructional technology	-0.44	0.04	.08***
Skills with instructional technology	0.08	0.12	.11***
Skills with instructional technology	0.82	0.10	.09***
Skills with instructional technology	0.61	0.02	.02***
Protecting the validity of grades in the field	0.42	0.08	.10***
Protecting the validity of grades in the field	0.19	0.03	-23***
Protecting the validity of grades in the field	-0.63	0.07	.01***
Perceived scope of vocational pedagogy	0.19	0.03	-23***
Perceived scope of vocational pedagogy	-0.63	0.07	.01***

B = Unstandardized beta, *SE* = Standard Error, *β* = Standardized beta *p < .05, **p < .01, ***p < .001

Both of the research topics were addressed simultaneously in interviewees' express answers to questions regarding their fundamental teaching philosophies, which addressed whether or not interviewees' decisions were

influenced by their ideas about teaching and learning. Even though the fact that most interviewees thought about changing the way their courses were delivered and they all talked about addressing and meeting students' needs as they arose, they rarely discussed how the pandemic had changed their opinions of teaching and learning or their obligations to students. Their choices were framed in terms of presumptions and values regarding instructional style, suitable workloads, and relationships with learners rather than rethinking their ideas. They believed that the outbreak was only a temporary problem and that they finally owed students a particular good. Consequently, lecturers decided to adapt their pedagogical practice in light of a pedagogical approach that defined their role to students in terms of trade, even though they saw value in acquiring new technology and abilities. Their technique of carrying it out changed, not the concept. Others did not feel the need to reevaluate their views on teaching and learning since they placed more significance on the development of students' critical thinking and problem-solving abilities than they did on any particular subject matter. But while emphasizing problem-solving and practical skills for pupils would have changed their techniques, their fundamental teaching philosophies remained unchanged.

4.2 What Informed the Changes Made to Their Pedagogical Practices?

The pedagogical approach was already effective, and the switch to online learning went rather well changes: Because no significant adjustments were required to maintain successful teaching and still attain predetermined learning targets, one-third of the lecturers we surveyed did not make any significant changes to their pedagogical approaches. For instance, interviewees who were utilizing a flipped classroom layout were easily able to translate the majority of their course material and outline online with minimal adjustments. The more seamless transitions to crisis teaching were also reported by interviewees who employed a problem- or project-based learning style, partly because their assignment structures (group projects, solo coursework) transitioned well to an online format. The majority of student work was completed outside of class, and Zoom made it simple to organize conferences between teachers and students. Despite being difficult, the outcome was ultimately favorable and largely successful. However, these interviews uncovered several adaptable pedagogical techniques that worked well for online instruction while preserving educational efficacy.

The degree of expertise in online education at the start of the outbreak: Five of the participants noted that their transition to online teaching was greatly facilitated by a prior understanding of abilities that have evolved into being crucial to online pedagogy. Experience with recording lectures, hosting Zoom conversations, and modifying a Learning Management System (LMS) site for their course are some of the most significant abilities we identified. In the distant situation, knowledgeable instructors were often more willing to try out novel tactics. For instance, Ash was skilled at filming lectures for their flipped classroom and uploading them to YouTube. This allowed them to offer live problem-solving sessions via Zoom during the planned class period. They were able to spend more time altering other course components because of how quickly they were able to make this shift, such as turning an exam into a practical remote alternative. However, others struggled due to a lack of technological expertise. Before the outbreak, three of them had only a passing knowledge of online teaching techniques; they claimed that they lacked sufficient training on how to make videos and that they knew nothing about Zoom. This suggests that it was challenging to solve the technical issue related to online instruction. The inference is that dealing with these difficulties would require time and effort that may have been better spent trying out new tactics or considering their teaching philosophies. Instructors who opposed modifications that entailed reducing assignments or loosening standards for evaluation, including pass or fail alternatives, raised concerns about how these changes may affect students' career paths, promote indolence, and exacerbate free-rider issues in group projects. The desire to give students a difficult education that appropriately assesses their professional preparation, as well as the instructors' sense of duty to the area and their profession, were other justifications offered by the instructors for these choices. Three lecturers stressed the significance of safeguarding the use of grades as measures of student knowledge development, or their degree of mastery: The professional obligation that most lecturers had to the profession was to ensure that students continued to learn everything they needed to know and had at least a basic level of mastery of it. As a result, they of concerned that changing standards would be against this obligation. Because they assumed a level of expertise that was not obtained, they saw the pass-or-fail regulations as a danger to the reliability of grades. Fundamentally, according to two interviewees, marks must show how well students have understood the subject matter; students cannot just be handed a pass mark by fiat.

Although a few of the technology lecturers we spoke with spoke about seeing serious student problems, the majority did not. It is unclear whether these problems didn't exist or whether they were just overlooked because students didn't speak up or because they were in a classroom that was just becoming asynchronous. Although some students resided in places experiencing heavy waves of infection at the time of the pandemic, others lived where there were few COVID-19 cases. We also noticed that professors wanted to maintain their professional relationships with their students, which led to some emotional distance. Some interviewees claimed that they preserved professionalism while teaching online. Others believed that the idea of discussing the moral and emotional issues surrounding COVID-19 did not belong in technology courses. These remarks show how course

adaptability and teaching philosophy interact, and they also demonstrate how instructors' values and ideas about the nature of technology-based education influenced their pedagogical choices.

5. Discussion

We discovered that teachers did make various adjustments to their courses given the urgency of the semester, however, the extent of those changes varied widely and infrequently showed substantial changes to their pedagogical stance. Instructors typically handled student difficulties on a case-by-case basis, identifying and assisting students more personally, or used broad modifications to course policies to make their course less taxing on students. The pedagogical change appeared to be guided by teaching philosophies, although for the majority of interviewees, these modifications did not result in substantial changes to teaching philosophies. While the pandemic provided an opportunity for innovation, instructors largely adhered to their teaching philosophies and conceptions, aligning their choices with existing circumstances. The instructors' aim to sustain professional standards and maintain a tough curriculum was mostly harmonized with pedagogical changes. Our study investigates the causes of some instructors' resistance to change. In particular, we highlighted some significant distinctions between engineering instructors' and instructors from other disciplines' approaches to course adjustments. There was a presumption that technology-based education is essential since it equips students for a career with high risks because errors made by technologists can result in fatalities, serious injuries, and property damage. This perspective is very different from classes with a smaller risk of damage, such as an introductory first-year seminar, as some of the instructors we spoke to stated. Future quantitative studies would probably discover significant variations in how instructional decisions were made based on the perceived consequences of doing so.

Additional instances of decisions made by lecturers that were constrained by their sense of obligation to technology education and the technical profession were revealed during our interviews. We observed examples of "considerate adaptability" as indicated by(Gelles et al., 2020) and the care work mentioned by (Hickling et al., 2021), but we also noted limits on the number of latitude instructors were ready to provide. Our results are consistent with those by Deters et al. (2020): Students talked about how professors were flexible while also striving to prevent any trickery and maintain challenge, and tolerance. The underpinning ethos of technology educators includes valuing "hardness" as a crucial component of technology pedagogy. (Hickling et al., 2021), the case is significant given our interviewees' demands that students meet a certain degree of course mastery while also adjusting to the challenges imposed by online learning. According to studies, a student's ability to cope with the epidemic was significantly influenced by their socioeconomic situation (Asgari et al., 2021). Although the lack of secure and affordable accommodation, unforeseen employment or job loss, and a lack of adequate study area are also significant factors (B. Hall & Henningsen, 2008; Williamson, Eynon, & Potter, 2020), the digital divide is a key factor in this situation. The cultural foundations of engineering are also visible in the teachers' general reluctance to offer social and emotional support, which several instructors perceived as falling outside the scope of their job duties. This is in stark contrast to early findings from studies covering a wider range of fields, including our own, which revealed that many instructors went above and beyond their typical duties to include mental health and self-care in their classrooms, raise money to provide students with technological equipment, and generally, shoulder increased demands for emotional labor particularly among women and instructors of the color (Gonzales & Griffin, 2020). The majority of the adjustments and other steps mentioned by lecturers were technical in the sense that they required adjusting how technology was used or how learning activities, including small group video conversations, were conducted. There were hardly any documented changes to the teaching pedagogy or learning objectives. Although their disappearance is striking, it may be a result of the survey's design (which asked about changes generally rather than in-depth questions about teaching goals or teaching philosophy). It shows that the majority of academics were trying to use new methods and technology to educate in a manner that was very similar to how they had previously taught face-to-face classes. This is not surprising given the extremely short time constraints given for curriculum adaptation. Academics may have more possibilities to engage with theoretical and philosophical issues relevant to their teaching if they have more time to reflect.

It is crucial to note that, although our discovery that profound change was uncommon, our respondents indicated several tactics that reflect effective pedagogical modifications that have been documented elsewhere to manage the urgent shift to online instruction. For instance, many of the actions they took fit into the four-part (Marquez & Garcia, 2021) models of "Interaction, initiation, reduction, and extension", as well as the three important aspects of (King, Saxena, Pak, Lam, & Cai, 2021; Lederman, 2020) the outline of effective teaching and learning during emergencies: knowledge (content), delivery, and assessment (outcome). Each of the lecturers we spoke to made significant effort to improve their interactions with students and provide them extensions when necessary or as a matter of policy. Others lowered the bar for assignments. Some reduced the effort by eliminating lectures and assignments while keeping crucial components for accomplishing course learning objectives. Similar to this, the interviewees devised procedures for regular encounters between students and professors, maintaining a sense of social and educational presence throughout the process.

Conclusion

Technology educators turned to a variety of inventive methods for remotely delivering technical and vocational education during this stay-at-home period. ERT uses the internet and a variety of software programs, including Moodle®, Microsoft Teams®, Zoom®, Google Classroom®, and WebEx®. These platforms/software for remote/online learning have been around for a while, notably during times of crisis. These online, for-pay teaching tools provide both synchronous and asynchronous instruction. This approach was chosen to assess how instructors' instructional practices have changed. Our interviews with technology lecturers lead us to believe that while their attitudes about pedagogy changed as a result of the emergency switch to online instruction, their beliefs and values remained mostly constant. After becoming familiar with various online technologies, many teachers were very eager to participate in synchronous online teaching. It is obvious that changing course design to fit the new context requires a lot of work, and a lot of time was spent researching online technology. Some participants described the change as an opportunity to gain new skills. Overall, the survey's findings indicate that technology educators made a lot of quick adjustments, which is something to be commended. There is still room to improve teaching in a transformational learning framework in addition to the concerns for online teaching that have already been discussed by changing the learning objectives and teaching methods for future online learning.

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Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm their contribution to the paper as follows: ***study conception and design:*** *Arikpo Sampson Venatius, Aede Hatib Musta'amal;* ***data collection and analysis:*** *Arikpo Sampson Venatius, Aede Hatib Musta'amal, Usani Ubi Ofem, Igbudu Chimemezuo Felix, Murugan Subramaniam, Otonko Praises Abang;* ***draft manuscript preparation and editing:*** *Arikpo Sampson Venatius, Aede Hatib Musta'amal, Usani Ubi Ofem, Igbudu Chimemezuo Felix, Murugan Subramaniam, Otonko Praises Abang. All authors reviewed the results and approved the final version of the manuscript.*

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