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Digital Pedagogy, Learning, and Assessment amidst COVID-19: Perceptions, Practices, and Prospects

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Abstract

The purpose of the research paper is to discuss the perceptions of university teachers and students towards digital classroom pedagogy, learning, and assessment methods in higher education in Pakistan amidst the COVID-19 pandemic outbreak. The researchers used the mixed method approach. The data was collected from a large-scale public-sector university with nine campuses across the province of Punjab, Pakistan. The instruments used for the collection of the data included Google Survey Form for students (n=92), university teachers' interviews via WhatsApp (n=15), and university students' views extracted from social media platforms i.e. official Facebook page of the university (n=20). The data obtained from multiple sources was analyzed using the corpus-based techniques for Sentiment Lexicon Generation (Darwich et.al, 2019). The findings of this study have revealed that 92% of students were interested in face-to-face classes and 82% of students had a preference for a face-to-face assessment. It has also been observed that the students also expressed their views negatively on social media regarding online teaching and assessment. They poured out their frustration against the university administration for conducting online assessments amidst COVID-19 qualms, chaos, and uncertainty. In contrast to this analysis, it has been perceived that both teachers and students struggled and successfully adapted themselves to the online environment. Moreover, it is interpreted from the university teachers' views that the quality of digital pedagogy, learning, and assessment can be enhanced through mentoring, observation, novel techniques and strategies, teamwork, and self-directed learning. The study has recommended that teacher education programs in Pakistan can organize digital pedagogical and assessment training for teachers to meet the drastic changes in pedagogy and assessment amidst COVID-19.

1. Introduction

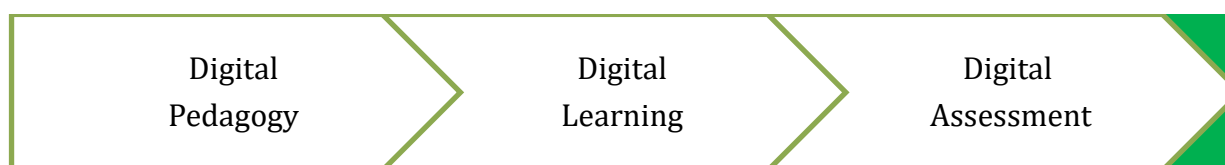
The impact of the global pandemic is of epic proportions as it has caused unique educational challenges and deepened existing ones. COVID-19 crisis has exposed social and economic discrepancies and inequalities in our society—a complex rift between connected and

unconnected. The inadequate internet accessibility has been a major barrier in digitalized COVID-19 era (Rafi, 2020). Irfan & Zafar (2020) believe that universities in Pakistan are compelled to innovate, collaborate more effectively and invent new avenues to alleviate the impact of this crisis on education. The teaching and assessment practices such as lecture delivery techniques and assessment procedures amidst COVID-19 were adapted pragmatically with regards to the learning needs of students. The effects of technology, creativity, flexibility, and resilience have helped teachers to cope with challenges and uncertainties in times of crisis; for bringing about digital transformation and social innovation.

At the same time, COVID-19 has increased different fears: fear of contagion, fear of each other- a fear that can't be simply mitigated with online chats, webinars, or learning platforms. The university students have experienced this fear created by digitalized pandemic era. It is observed that even before the forceful intervention of the global pandemic, Pakistani students and teachers were living in the digital era. Their experiences were molded by digitalization, for instance, in the forms of social media and classroom technology (Irfan & Zafar, 2020). However, COVID-19 has brought about radical changes in education concerning compliance and adaptation to digitalized modes of learning, pedagogy, and assessment in Pakistan. The current study is presented in figure 1 that displays the COVID-19 digitalization model in Pakistan.

Figure 1

COVID-19 Digitalization Model in Pakistan



Irfan and Zafar (2020, p. 91) in their study further recommend that education is not just about imparting knowledge but training the people to cope with critical times such as the COVID-19 pandemic outbreak. It is necessary to change the discourse about pedagogy, learning, and assessment to develop the competence of learners for solving issues and challenges. COVID-19 dilemma has stimulated universities to adopt blended learning that integrates online educational resources and opportunities for interaction online with traditional classroom methods (Bonk et al., 2006).

The government and universities in Pakistan responded to the COVID-19 educational crisis and swiftly adapted to the online mode of learning, teaching, and assessment to cater to the needs of the learners. However, the government in far off regions of the country needs to create many digital centres for the public to have access to online resources (Asif et al., 2020).

This paper is about university students' and faculty's perceptions of the digitalized mode of instruction, learning, and assessment. The faculty and students tailored themselves to digital learning, pedagogy, and assessment but for students, online learning and assessment have been a complex phenomenon as it is perceived that online assessment results would be unpredictable and

might cause harm to their future lives and careers. This research was guided by two research questions:

Q.1 What are the university faculty's views of digital pedagogy and assessment amidst COVID-19?

Q.2 What are the university students' perceptions of digital learning and assessment amidst COVID-19?

The purpose of above stated research questions is to prove that pedagogy, learning, and assessment practices have been adapted in digitalized COVID-19 era.

2. Literature Review

In Pakistan, teachers and learners have a natural preference and interest in face-to-face teaching, learning, and assessment processes, but they rapidly and flexibly adapted themselves to digitalized modes of learning, pedagogy, and assessment as they had no choice (Rafi, 2020; Irfan&Zafar, 2020). Palfrey and Gasser (2008) view that adaptation was not a surprise as the current generation has both access and essential skills to use networked digital technology. They further point out that today's generations are deeply immersed in digitalization with regards to skillfully competent operation of technology and digital devices. The excessive use of technologies has transformed the lives and experiences of people across the world (Jukes et al., 2010).

It is observed that learning in the COVID-19 digital era is multifaceted, vibrant and challenging, hence, it is pertinent to understand the diverse learning and pedagogical methods and styles (Jones, 2015). The activities and life experiences of learners and teachers are mediated and tailored by technology (Jukes et al., 2010; Ahmed et al., 2018). This generation spends most of their time with smartphones, laptops, LCDs, etc. They have the potential to use digital technology and are persistently connected with the online world for information, social networking, and entertainment (Prensky, 2012; Kasbi & Shirvan, 2017). The teachers need to design the instructional material to be delivered digitally for active engagement of their students with educational content (Falck., et al, 2018; Luna, 2015). Franco (2013) believes that this digital age produces a positive attitude towards learning.

Therefore, English teachers in Pakistan should empower digital learning platforms as part of their classroom instruction activity to make learning more engaging, interesting, and interactive (Asif et al., 2020). This is true of the blended mode of instruction in which face-to-face classroom practices are jointly offered with computer-mediated activities regarding content and delivery (O'Byrne et al., 2015). Blended learning is also used in professional development and training settings (Banerjee, 2011; Boyle et al., 2003). Blended learning models are the face-to-face driver (the teacher drives the instruction and clarifies the concepts using digital tools), rotation (students cycle through a schedule of face-to-face and online study), flex (curriculum is taught through technology but teachers provide face-to-face support, and consultation), labs (curriculum is taught through the digital platform in a physical location), self-blend (traditional learning takes with online

course work and online driver (online platform with teacher check-ins) (Garrison & Kanuka, 2004; Moss & Fink, 2014; Ziegler et al., 2006).

Palfrey & Gasser (2008) believes that even before COVID 19, the learners were digitalized as they were engaged in diversified digital activities such as, social and community networking, chatting, music, shopping, news, games, websites, Netflix, YouTube, Google and so on. Shortly, digital media is closely interwoven with their lives. Padmavathi (2013) has discussed the significant features of digital times that are contextualized, reliable, valid and authentic pedagogical and learning materials, activities and resources, online libraries, media and communication skills and integrated language and information. He further highlights the use of some more digitalized characteristics, for instance, registers, style, multimedia, online tools for reading, text management, spell checks and web page production and publication. These up-to-date resources and activities motivate the students and are relevant for the digital age. However, learning in the digital era is riddled with perplexity and intricacy as it demands even handed steadiness of academic, work and social life (Cunningham et al. 2013; Jones, 2015; Dörnyei, 2017).

COVID 19 digital era describes learners as agents who are interconnected, interrelated, and interdependent (Pappas et al., 2017). It is an era of indiscernible fear and has exposed a wide economic gap that exists among diverse communities. In Pakistan, marginalized communities do not have access to equal facilities of life. Inaccessibility of internet connection and sporadic internet connectivity for students living in remote areas of the country is a huge challenge. This dilemma is related to their fears about online assessment (Rafi, 2020). Assessment is an essential component of an education system since it influences both teachers and students in the form of a washback effect that can be positive or negative (Bachman & Palmer, 1996).

Assessment is an essential component of the education system because it maintains a potent impact on teachers and pupils. It provides necessary information about learners' achievements to take rational educational decisions (Schellekens, 2007). The teachers need to be trained to construct and mark students' assignments and papers as their decisions might affect the learners' lives (Irfan, 2020). The tests are of various types, such as proficiency test (measures learners' ability in a language), achievement test (end of the year assessment), a placement test (places learners at different levels of education), and diagnostic test (finds out strengths and weaknesses) (Hughes, 2003; Puppini, 2007). The board and university examinations are considered achievement tests in Pakistan (Irfan, 2018; 2020).

Every country has its case study in the educational sectors that have created an impact in teaching and learning perspectives during the COVID-19 outbreak. This paper discusses students' and university teachers' perceptions (specifically in Pakistan) of assessment that has been a challenging experience amidst COVID-19 fear as unpredictable assessment outcomes might affect their future lives adversely.

Assessment in Pakistan is traditional as it is inauthentic and decontextualized and has a focus on cramming the course contents. As Siddiqui (2007, p.189) believes, 'in Pakistan assessment system excludes creativity and critical thinking out of its legitimate boundaries'. It is stated in National Education Policy (1992, p.69) 'we are caught in a vicious circle; the cycle begins at a badly constructed syllabi and ends at a rag bag system called examination'. It lacks the qualities of a good test such as reliability, validity, authenticity, practicality, and resourcefulness

(Bailey, 1998; Brown and Pickford, 2006). The students find it a hard reality to accept digitalized assessment because they are accustomed to the conventional mode of assessment.

National Education Policy (2001, p.38) states, ‘the public examinations in Pakistan are invalid and unreliable as they encourage cramming’. Siddiqui (2007, p.164) rightly says ‘the student's memories ready-made answers ... because assessment system encourages rote learning and the examination requires the students to reproduce what they have learned by heart’. McNamara (2000) also believes that traditional tests like Board Examinations, do not positively contribute to students' learning. Irfan (2020, p.764) asserts, "all annual board and university examinations in Pakistan are thought to be highly traditional and stereotypical”.

The subsequent paragraphs discuss that sentiment Analysis (SA), or opinion mining (OM), is, in essence, a natural language processing (NLP) task that involves the detection of user sentiment, attitude, emotion, and opinion in natural language text. The lexicon-based approach involves making use of a sentiment lexicon to compute the global sentiment polarity of a text document, based on the aggregation of the polarity of individual words embedded within the document (Saif et al., 2017; Fernández-Gavilanes et al., 2016; Hutto, & Gilbert, 2014; Taboada et al., 2011). The primary issue in this approach is that some features are beyond the reach of human introspection and a supervised classification technique would be able to detect these hidden features. Conversely, the classification-based approach involves constructing supervised machine learning classifiers that are fed with manually labelled training data for the classification task (Xing, Pallucchini, & Cambria, 2019).

The primary issue with this approach is that it requires manually labelled training data for achieving relatively good accuracy. It is computation-intensive and naturally possesses a hidden, black-box process. The main task of SA is to classify the text units according to their polarity of positive or negative. SA makes possible a rich set of applications that range from detecting sentiment towards certain topics in the product reviews domain, customer relationship management, stock market, and political figures among other domains (Chaturvedi et al., 2018; Mantyla et al., 2018; Liu, 2015).

In short, the literature discusses that teachers and students are using digital tools before the COVID-19 pandemic but we're used to traditional methods of teaching and learning. They had no choice but to tailor themselves swiftly to online modes of pedagogy, learning, and assessment. The most challenging aspect is online assessment as university students are anxiously concerned about their future lives. In addition to this, the literature related to corpus linguistic approaches such as sentiment analysis or opinion analysis has also been discussed because data in the subsequent section was analyzed using corpus linguistic tools.

3. Research Methods

This study has used a mixed method approach with the concurrent deployment of both qualitative and quantitative research methods. The data was collected from a large scale public sector university with 9 campuses across the province of Punjab, Pakistan. The instruments were Google survey form for university students, interviews of university teachers via WhatsApp, and university students' views on social media such as an official Facebook page of the university.

The sample size for the Google survey form was 92 students of the Department of English. The selected programs were MA English, BS English, and MPhil Linguistics. The google survey link was shared in the students' Google Classrooms. The students were voluntarily invited to participate in the research. Google survey form comprised close ended questions. The results of the Google survey form were downloaded in excel spread sheets and pie charts. The Google survey forms data were represented in the graphical mode.

Fifteen faculty members of that selected university participated in the research. The interview questions related to digital pedagogy and assessment were sent using the WhatsApp application. They responded to questions through WhatsApp voice recorder. The interview questions were open ended. The questions were as follows:

1. What are your perceptions of the use of digital pedagogy amidst COVID-19?
2. What are your views about using digital assessment amidst COVID-19?

The researchers explored the official Facebook page of that university to get first hand information about students' sentiments regarding digital mode of learning and assessment. While exploring the official Facebook of the selected university, the researchers copied only those comments that expressed their fear of examination and online learning challenges to remove any bias and took into consideration the research ethics. The researchers had selected the official Facebook page of the university that has been joined by 35, 000 students and employees. It is a public Facebook page. Still, considering ethical requirements for this study, the identities of university faculty and students have been confidential. They have been de-identified by giving acronyms such as T1, T2, T3 and S1, S2, S3, and so on.

A sample corpus that included the written texts of the Google survey form, university students' views on social media such as, Facebook, etc., and written answers to the questionnaires, was also developed to incorporate a corpus-based approach, as a quantitative dimension in the study. The justification for selecting multiple modes of data collection was to reinforce the perceptions of university faculty and students about digital pedagogy, learning, and assessment amidst COVID-19. The researchers integrated the data collected from multiple sources like Google survey form, interviews, and official Facebook page with corpus linguistics approach SA to make a substantial contribution to corpus linguistics and English language teaching.

The researchers specifically selected the Department of English students and faculty to examine their perceptions of online learning, teaching and assessment problems. The main reason was that most of the students of English language programs were from diverse urban and rural backgrounds. They were attending online classes from different villages, towns, and cities of Punjab. The students living in remote rural areas had experienced more challenges as compared to students based in big cities of the province Punjab. Those faculty members of the Department of English were selected who were engaged to teach these students.

4.Data Analysis

The data was analyzed from three primary quantitative and qualitative sources which are, google survey form, interviews using a WhatsApp voice recorder, and the official Facebook page of the university. The qualitative findings were also analyzed using corpus-based techniques for ‘Sentiment Lexicon Generation’ (Darwich et.al, 2019). The findings have been categorized into three stages. The purpose of mixed methods is to synthesize the data to prove the research questions related to perceptions of digitalized pedagogy, learning, and assessment amidst COVID-19.

4.1 Results from Google survey method

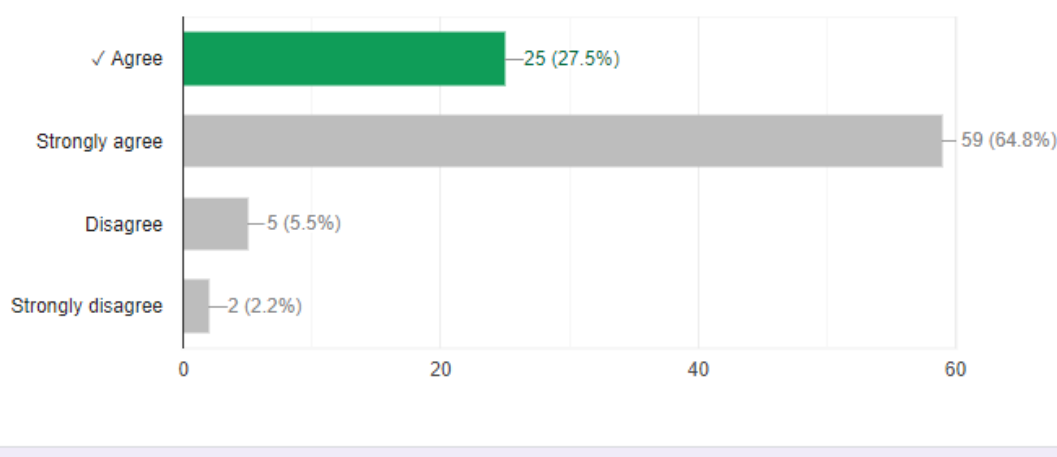
The results from the Google survey method are as follows:

4.1.1 Interest in the face to face classes

The students develop comprehensive understanding of concepts and lectures in physical and interactive classroom settings in comparison to online mode of teaching. The figure 2 explicitly illustrates this notion. It is shown that 92% of students have an interest in face to face classes in the university.

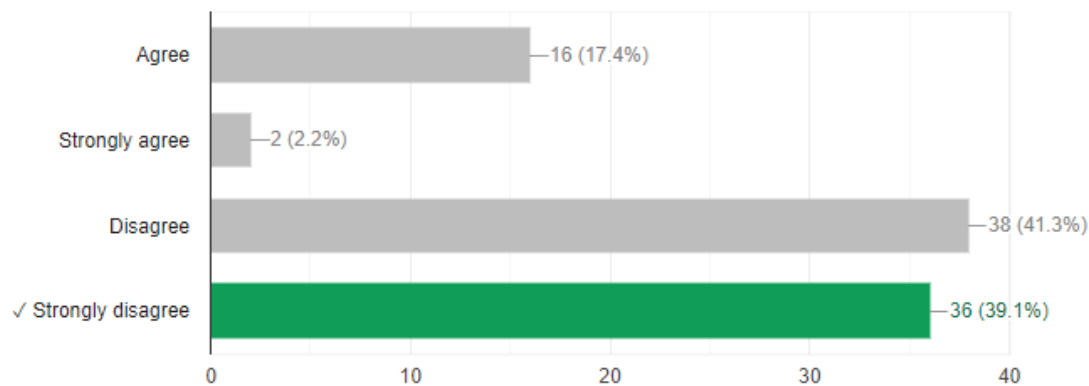
Figure 2

Interest in face to face classes



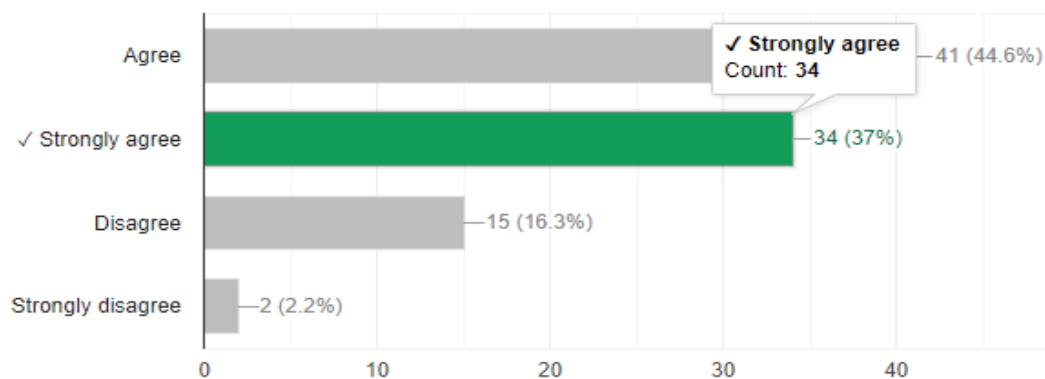
4.1.2 Interest in online classes

The students have more preference for the face to face classes because in person classroom environment is more motivating for acquiring the challenging lectures. It is shown in figure 3 that 80% of students disagree that they have an interest in online classes.

Figure 3*Interest in online classes*

4.1.3 Preference for face-to-face assessment

The paper based face-to-face assessment is more reliable and diagnostic. This mode of assessment can also discriminate more capable students from average students. Figure 4 demonstrates that 82% of students report that they have a preference for face to face assessment in universities.

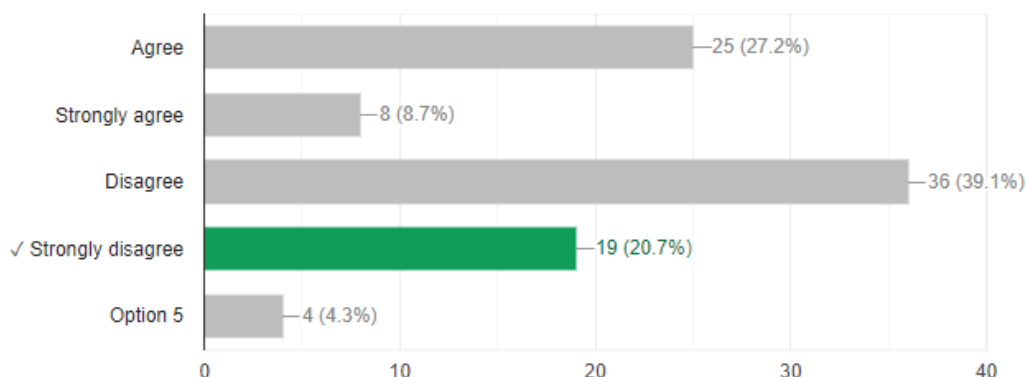
Figure 4*Preference for face to face assessment*

4.1.4 Preference for online assessment

Most of the students find online assessment unreliable, invalid and unpredictable. The figure 5 shows that only 36% of students have a preference for online assessment.

Figure 5

Preference for online assessment

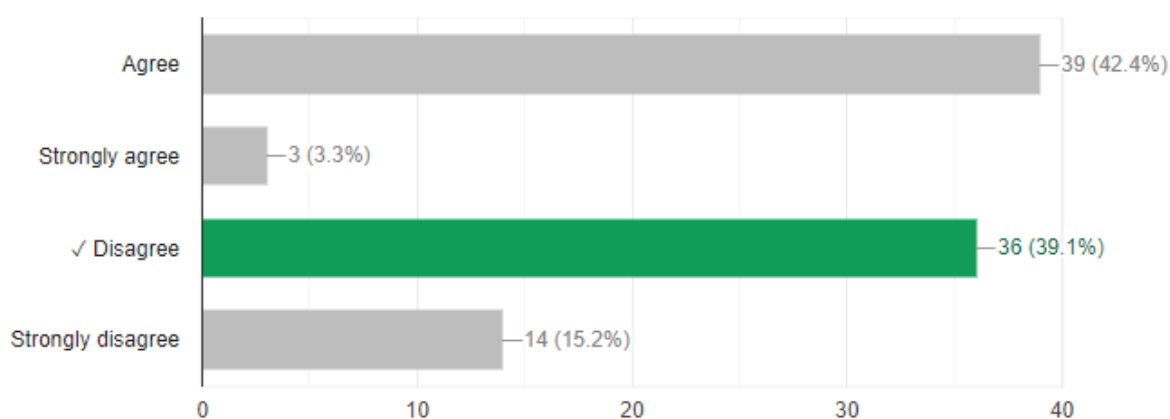


4.1.5 Anxiety about face to face assessment

It is interpreted from figure 6 that 46% of students have anxiety about face to face assessment because the rigid invigilation scenario leads to heavy dependence on paper based examination skills.

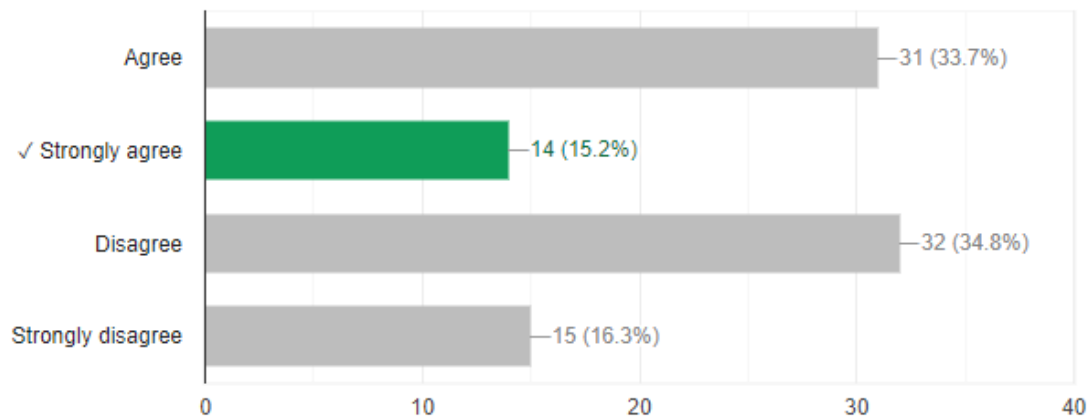
Figure 6

Anxiety about face to face assessment



4.1.6 Anxiety about online assessment

There are various reasons that make students nervous about online assessment. It is observed that 49% of students are nervous about online assessment (see Fig. 7). The Figures 6 and 7 imply that examinations under all circumstances are instinctively challenging for students.

Figure 7*Anxiety about online assessment*

It is interpreted from the survey findings that a large majority of students expressed their preference for face-to-face interactive classes rather than online classes. These survey results have been reinforced by the students' perceptions captured on social media (see section 4.2). Section 4.2 has presented the students' sentiments and perceptions of digital learning challenges and assessment.

4.2 Qualitative Data Analysis

The qualitative data is presented in three parts. Section 4.2.1 discusses university students' perceptions of digital learning. Sections 4.2.2 and 4.2.3 describe university teachers' views about digital pedagogy and assessment.

4.2.1 Students' perceptions of online teaching and assessment on social media

The researchers explored the social media pages of the university to explore the students' problems concerning digital learning and assessment. It is interpreted from the students' sentiments that they have experienced tremendous stress and challenges amidst COVID 19 predicament. The pandemic has not merely created academic issues but also led to psychological problems on the part of the students. Their views transparently reflect their anxiety and frustration. The students demonstrate negative attitudes including hostility towards the university management. They give vent to negative emotions on social media without restraint when they read the university notification about online assessment. These are their views:

- a) Our mad university is making us crazy(S1).
- b) Many students are facing internet connectivity issues (S2).
- c) There is terrible confusion(S3).
- d) I think it's fake news(S4).

- e) There is discrimination between their students and students of affiliated colleges. It looks they want the students of affiliated colleges to fail(S5).
- f) Today's mock test had some issues with keys as the correct answers were marked wrong(S6).
- g) Kindly cross-check the issue so that it must be avoided in final exams(S7).
- h) Please stop online MCQs based examination because it is going to kill our grades #stoponlineexams(S8).
- i) Please have mercy on us (S9).
- j) Worst examination policy (S10).
- k) Sir today was our mock exam. Many students faced multiple problems including incorrect marking and login issues even they had a good internet connection. Kindly have a look at students' future and either stop online exams or provide satisfaction regarding the LMS system (S11).
- l) Worst management .. 8th-semester ke paper late kr dye ..inse 2nd aur 6th ke papers bhi manage nhi hone ... Baadmai inho ne kehne 15 sep ko jb unikhule gitbsb ke dubara paper honge. (S12).
- m) Sharmanichey (Shame on university management) including VC sahb(S13).

It is interpreted from their sentimental views that the COVID-19 scenario was an enigma and a testing ground. They struggled with their academic problems and other issues such as internet connectivity etc. They blamed the university management for conducting online assessments amidst COVID-19 chaos and uncertainty. Their use of words such as, "mercy on us" and "students' future" creates pathos whereas their words and phrases, "worst examination policy", "discrimination" and "shame" reflect their natural animosity that they deeply felt against the university management for conducting online examination amidst pandemic. They were anxious about their grades that might affect their futures. However, it is observed that they didn't make negative comments about their learning difficulties. It is interpreted that they were more concerned about their results.

4.2.2 University faculty's views about digital learning and pedagogy

"I think it's very useful because it's almost the same as teaching or studying in traditional sort of setup, only medium changes. Time is saved enormously which is the best part. Time is saved in a sense that one doesn't need to travel far off to attend a class" (T1). "Teachers need to be trained though." (T2). "With the right tools and training, it is the best way to ensure quality" (T3). "For my writing courses, I use flipped classroom approach with resources on LMS and google classroom" (T4). "In my view, digital pedagogy is a very effective mode of teaching" (T5). "I recently concluded a Ph.D. course. Seminars were scheduled for three hours daily from Mon to Fri for three weeks. I had nine students and this was the first course for year 1. I had a great experience with pedagogy, student participation, and assessment. I had unlimited Zoom provided by my university which students used outside their regular three hours to do group work. I have been engaged in lots of training arranged by my university regarding how to adapt courses for the online environment. It was hard work but my student's participation made it worthwhile" (T6). "I think digital pedagogy benefits teaching-learning process more than traditional one" (T7).

"It was very challenging in the beginning and became better with time. Teachers struggled to make their teaching effective, interesting, and interactive. Lack of gadgets, training, good

internet speed, and paid programs (like zoom) were the biggest challenges. But most of the teachers managed to conduct online classes successfully. Learners on the other hand had more serious issues. They seriously lack gadgets and internet connectivity and speed. The attendance was 40 to 50 percent. Most of the students went back to their far flung villages and were using social media packages. Their interest was not consistent maybe because they were not trained for self motivated learning. They are spoon fed and pressurized to learn in traditional classrooms but it is lacking in the online classroom. To me, it has huge advantages for teachers and students but it has huge loose ends too which need to tie up. It can be successful generally for privileged learners but for the underprivileged and poor class, it is generally challenging. It needs a complete paradigm shift which is not possible on an emergency basis. I learned a lot of good things to improve myself as a teacher but worried about my students learning” (T8).

“Requires a lot of planning and hard work at the front end and a repertoire of strategies to have an online presence as an instructor throughout the course without always being in a synchronous classroom setting; also, to keep the students meaningfully engaged and interested. It is different from remote teaching” (T9). Digital pedagogy directs learners toward self-directed learning. Moreover, learners do not only stick to the recommended resources but also consult other online resources. Online learning resources and tools also make students more creative and productive (T10).

“The change from teacher-centered environment to learning-centered environment is an achievement of the digital world. Digital pedagogies and assessments enhanced the traditional models of education. The incorporation of technology as an intellectual partner has enhanced the mode of teaching and learning with endless possibilities. Keeping under-resourced background of multiple students, the intellectual partner "technology" becomes an obstacle in learning and teaching. Internet connectivity issues, unaffordable internet packages, lack of proper training, and many other factors have created multiple problems for learners and instructors. The primary focus of digital education is individual based learning which fails to meet its criteria in under resourced environment. Digital citizenship and under resourced environment is a question of debate as latter is a hindrance in adopting innovative digital pedagogies and education” (T11).

The university teachers report that they were advised to use various online applications such as Learning Management System (LMS), Zoom, Google Classroom (GCR), and Google Meet for teaching students. The quality of the digital pedagogy will become effective and productive if digital education training is imparted to teachers.

Interestingly, it is perceived that both teachers and students worked hard to adapt themselves to the online environment. In the beginning, it was a jerky process but gradually it became smooth and transparent. The faculty also experienced many issues such as slow internet speed, lack of gadgets, and paid programs like zoom but gradually these challenges were overcome and teaching became efficient and interactive. The students participated actively in both group and individual online activities and tasks. It is believed that effective digital pedagogy is more valuable than traditional methods of teaching. However, it is interpreted that underprivileged students struggled and suffered more than privileged class pupils especially those students who lived in remote regions of Pakistan. Their attendance was extremely low as compared to students living in big cities with adequate digital facilities.

A noteworthy benefit of digitalization is that it enhances personal autonomy and self-directed learning. The students explored and consulted various online resources for acquiring creativity and criticality embedded with academic achievements. Above all, digital pedagogy and assessment improved the traditional models of education. At the same time, a question of equal distribution of resources and technology as an intellectual partner of education arises. Another worth stating point is gaining equal access to digital citizenship.

4.2.3 University faculty's views about digital assessment

“Assessment is somehow a tricky part, teachers need to be very careful at that part. One must assess intellectually while implementing digital pedagogy. Questions must be of practical kind of approach which are entirely based on students creativity despite cramming” (T1). “For assessment, I use feedback and marking criteria as students perform online as a designated time and task(I share and mark students online). For the speech courses, the online assessment worked well, but for the writing courses, I'm still developing strategies to maneuver the assessments” (T4). “However, it asks for creativity on part of teachers to assess students' learning. Moreover, in the light of pedagogical practices during COVID-19 we need trained teachers to cope with drastic changes in pedagogy” (T5).

“I assessed my students on their engagement with key reading. They were asked to answer open questions online every day before the seminar. I asked them to peer review their classroom contribution. They were also asked to write a conference abstract in response to an actual conference call, give an individual presentation on ethics in the context of their student. They also produced a grant application in response to an actual grant call by a funder. This was a group project” (T6). “Digital pedagogy provides a different platform for assessment which is not passive but active evaluation on the performance of learners” (T7).

“It requires a different approach to assessment with more formative assessments, assignments, etc, quality assurance through session observations and mentoring, and ongoing refinement of strategies through strong collaboration and interconnectedness” (T8). Assessment is still a bigger challenge” (T9). In digital assessment, more papers can be saved since it is environmentally friendly. It also introduces students to new technologies in the field of education. Candidates can check their exam results by the end of the exam, likewise, it also reduces the administrative burden of paper checking and result declaration (T10).

Assessment is not only perplexing but a pertinent aspect of an education system. The digital question papers should be constructed with utmost care and thoughtfulness. The question papers should have good qualities of a test such as practicality, reliability, validity, meaningfulness, and authenticity. It should not merely assess the ability to memorize the material but needs to be focused on comprehension, originality, creativity, and critical thinking. The quality of a digital assessment can be assured through regular practice, monitoring, mentoring, observation, innovative techniques, strategies, mutual collaboration, and sharing of novel ideas. Digital assessment reduces the burden of teachers in terms of physical invigilation duty and manual marking of huge sets of answer sheets. The scores have objectivity and can be immediately released.

4.3 Generation of Sentiment Lexicon by Corpus Analysis

After analysis using survey-based approach, we have also performed corpus analysis on two sample corpora that contained reviews on digital teaching and learning:

1) Teacher Reviews Corpus and 2) Student Reviews Corpus. A sentiment lexicon used in the latest research on ‘Sentiment Analysis’ about comments was carried out [1], to analyze positive and negative reviews on the two corpora. Although, this lexicon was laden with English as well as Roman Urdu sentiment terms, but required more terms that were specifically related to reviews related to ‘Digital teaching and learning. Therefore, this lexicon was updated by adding new sentiment terms. A new sentiment lexicon was generated using these two corpora, that provided variation in the terms that were used to express positive and negative sentiments. A total of ‘129’ sentiment words (66 positives, 63 negatives) were extracted to identify positive and negative words in the corpus.

Figure 8

Rules for the identification of positive sentiments

```
Rule:Positive
(
  {Lookup.majorType==positive}
  |({Lookup.majorType==positive}{Token.category==NN})
  |({Lookup.majorType==positive}{Token.category==NNS})
  |({Token.category==NN}{Token.category==VBZ}{Lookup.majorType==positive})
  |({Token.string==no}{Lookup.minorType==worst})
  |({Token.string==not}{Lookup.minorType==worst})
):con
-->
:con.Positive = {Rule=Positive}
```

Figure 9

Rules for the identification of negative sentiments

```
Rule:Negative
(
  ({Lookup.minorType==worst})
  |({Token.category==NN}{Lookup.minorType==worst})
  |({Lookup.minorType==worst}{Token.category==NN})
  |({Token.string==no}{Token.category==NN})
  |({Token.string==no}{Lookup.majorType==positive})
  |({Token.string==not}{Lookup.majorType==positive})
):label
-->
:label.Negative = {Rule=Negative}
```

Terms added to the lexicon can capture a single word to identify positive and negative reviews. For the analysis of aspect, a few simple rules that involve linguistic patterns were analyzed and added in the application pipe line developed in the GATE tool [2]. The application pipeline comprised of basic language processing resources (Tokenizer, Sentence Splitter) used from the built-in "ANNIE" application in GATE [3]. After, applying basic language processing, a modified version of the lexicon was added to match positive and negative sentiment terms. In addition to single word match, a simple set of rules were added for both categories as presented in Figure 8 and Figure 9 above, where, NNS noun, plural; VBZ verb 3sg pres; NN sing or mass noun. Results found on the students corpus are shown in Figure 10 and Figure 11 while results on Teacher's corpus is shown in Figure 12 and Figure 13.

Figure 10

Negative sentiments identified in Students Sample Corpus

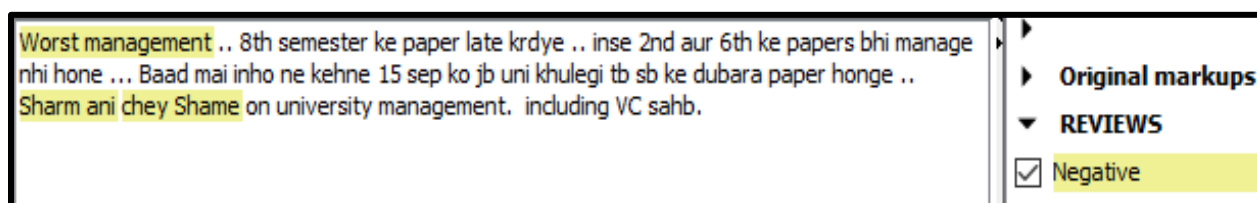
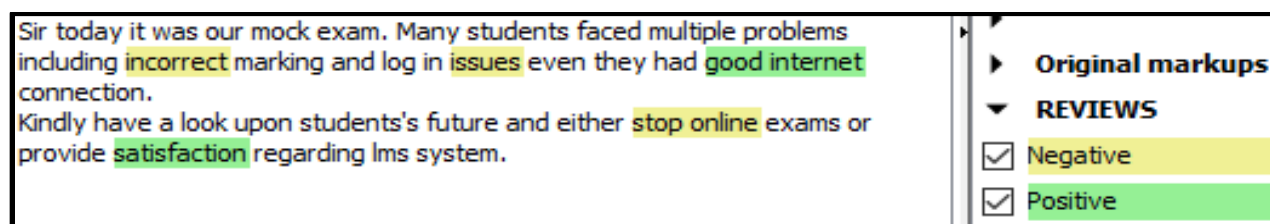


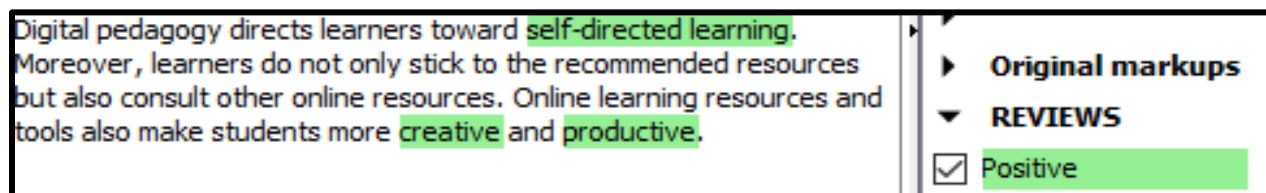
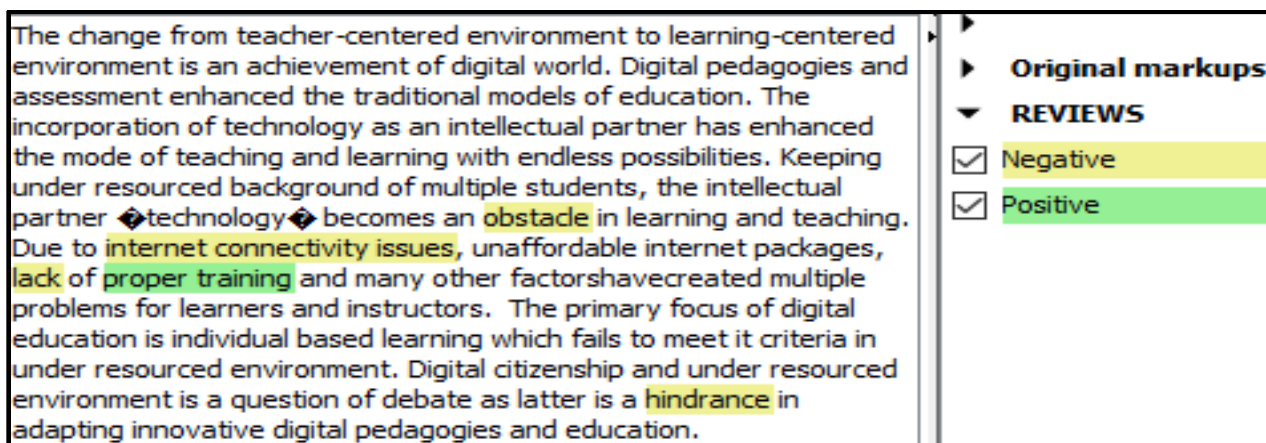
Figure 11

Identification of negative sentiments in students' comments



It was seen that the majority of reviews (see Figures 10 & 11) from student corpus were found negative and contained a mixture of English and Roman Urdu terms for expression of sentiments. The students express their national emotions through the use of code switching. In addition to this, it was difficult to observe linguistic patterns to extract sentiments from student corpus. In the case of both sentiment terms in any review, a maximum number of positive or negative sentiments can help in the finalization of the overall category of that particular sentiment.

In comparison with teachers' corpus, more sophisticated writing helped in the identification of linguistic patterns to categorize positive and negative reviews (see Figures 12 & 13). It was observed that teachers expressed more in terms of giving suggestions, working on improvement, and learning new technology during this digital teaching and learning experience amidst the COVID-19 pandemic.

Figure 12*Identification of positive sentiments in teachers sample corpus***Figure 13***Identification of negative sentiments in Teacher Sample Corpus*

5. Discussion of the Findings

The paper has presented the multimodal data analysis to prove the research questions. It is discussed that the global pandemic has revealed the social and economic disparities within the society. It has also increased fear that cannot be merely reduced by online classes and webinars. Digitalization did not cause a shocking experience for both students and teachers as they were engaged in diverse digital activities before the COVID-19 outbreak. However, it is noted 92% of students had an interest in face-to-face classes while 82% of them expressed their preference for face-to-face over online assessment. It is noteworthy that 49% of students are very nervous about online assessment. They, in an unrestrained manner, give vent to their sentiments using negative words such as, "crazy", "terrible", "confusion", "fake" etc. Most probably, anxiety about future careers produces negativity and reluctance in them to accept sudden changes in their lives without resistance. They are used to conventional modes of learning and assessment.

On the other hand, university teachers perceive the situation positively. They have flexibly adapted themselves to digital pedagogy that is a beneficial mode of teaching. They believe that teaching and learning quality can be enhanced through teacher education. They understand that students living in rural areas of the country have undergone significant challenges such as

expensive internet packages, slow and sporadic internet connectivity, and lack of devices for attending the classes.

The multimodal data has been integrated with Sentiment Analysis that is a lexicon-based approach of corpus linguistics to explore positive and negative sentiments of university teachers and students.

6. Conclusion and Recommendations

In short, it is perceived from the evidence that students underwent several challenges amidst COVID-19. They expressed their negative views against digital assessment. On the other hand, university faculty swiftly adapted themselves to new situations and found out to be more motivated and positive with regards to their opinions about digital pedagogy, learning, and assessment. They had taken a plunge into digitalization without training but COVID-19 provided them remarkable training about using various applications of pedagogy and assessment through classroom practice. The university teachers presented authentic tasks in their digital classrooms with careful planning, creativity, and critical thinking. They assessed the learners' potential for creativity, reflection, and criticality. The learning ability of the learners was assessed by both teachers and peers. A few applicable recommendations are:

- a) The primary focus of digital education is to prepare individuals for digital citizenship that can be ensured through the establishment of digital centres across the country.
- b) The teacher education programs in Pakistan should impart digital pedagogical and assessment training to teachers to cope with sweeping changes in pedagogy and assessment amidst COVID 19.
- c) The quality of digital pedagogy, learning, and assessment can be substantially enhanced through monitoring, close observation, mentoring, innovative techniques, ongoing refined and adaptable strategies, interactive sessions, mutual collaboration, and interconnectedness.

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