FORMATIVE ONLINE ASSESSMENT AT HIGHER EDUCATION LEVEL: A MIXED METHOD APPROACH

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ABSTRACT

Title: Formative Online Assessment at Higher Education Level: A Mixed Method Approach.

The study aimed to analyse the environment of formative online assessment at the higher education level. Additionally, it sought to explore the experiences of teachers and students in this context and compared the experiences of students based on demographic variables such as gender, sector, and residential area. To achieve these objectives, the researcher utilized a concurrent triangulation mixed method design. This study population included 169 teachers and 5362 students from six universities in the Islamabad Capital Territory, all of which offered common undergraduate programs in Social Sciences. The adapted survey questionnaire and the structured written interview protocol were used. A stratified random sampling technique had been used to collect data from 370 students through a survey questionnaire. A convenience sampling technique was employed to collect data from 17 teachers through an interview protocol. The analysis of quantitative data was conducted using descriptive statistics (frequencies/percentages) and inferential statistics (independent sample t-test, one-way ANOVA). The analysis of qualitative data was performed using thematic analysis. Overall findings concluded that the total environment of online formative assessment was inefficacious for both teachers and students in terms of virtual, emotional, and intellectual settings. Moreover, general findings indicated that both students and teachers experienced several benefits, such as time-saving, the flexibility of place, and convenience for everyone. Whereas, both students and teachers also encountered some challenges, including unproductive learning, lost internet connection, electricity issues, workload, cheating, and unfamiliarity with the latest technology (LMS). It is recommended that diverse stakeholders may work together to improve the quality of products or services required for formative online assessment.

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LIST OF ABBREVIATIONS

SOAEF	Supportive Online Assessment Environment Framework
SOAEQ	Supportive Online Assessment Environment Questionnaire
SWIPF	Structure Written Interview Protocol Form
COVID-19	Coronavirus Disease of 2019
F2F	Face 2 Face
Ho	Null Hypothesis
ANOVA	Analysis of Variance
LMS	Learning Management System

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Dedication

This modest effort is sincerely dedicated to my ever loving parents (mother and late father) for their prayers, valuable support, love, appreciation, encouragement and inspiration which made it possible for me to complete my research work.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Formative online assessments have rapidly transformed higher education assessment practices in Western countries. Teachers ensure that they use the full capacity of the online platform and build effective assessment methods that are useful in the teaching-learning process and for transforming the academic system (Whitelock, 2019). In this procedure, Information Communication Technology (ICT) has emerged as a crucial instrument that helps to improve assessment approaches. Online assessment is not only a source of inventing new technologies to reform existing unproductive assessment applications and improve students' technical skills, but it also evaluates novel academic objectives. It is a golden chance for us to reconsider our curriculum and the entire educational system. All centralized universities are moving towards online learning, instruction, and evaluation processes in the near future. Therefore, there is a need for all schools and colleges to integrate technology into their education system (Gov, 2016; Elzainy et al., 2020). Even in 2017, the National Association of School Psychologists (NASP) stated that online assessment is the least prioritized researched area of Tele-health, just like in the education sector. This issue became highlighted in 2020 when the lockdown created hurdles in the conduct of face-to-face assessments. That pandemic not only challenged higher education administration to change their testing practices but also forced individuals to replace their old learning/handling styles related to assessment completion in each field of their life, whether in the health or education area (Farmer et al., 2021a, 2021b).

The coronavirus disease of 2019 has badly affected higher education since 2019. The foremost challenge has been the online assessment of the learning process because the traditional education system format, which is face-to-face lectures and assessments, has been moved online without proper planning. There has been no suitable arrangement made by all university management authorities. According to the Higher Education Commission (HEC) in 2021 all higher academic institutions have remained closed for physical presence until June 2021. All academic activities, like learning and evaluation, were conducted online using Google Meet and Zoom App. Students also demanded online assessments in a supervised environment. Universities/colleges faced enormous obstacles regarding how to operate productively, efficiently, and safely, similarly for the 2020-21 educational year when universities tangibly closed and tests could not be administered. As stated by Khans and Jawaid (2020) assessment is a fundamental part of the teaching and learning process, as it is helpful in the accomplishment of course learning outcomes by the students. In Pakistan, before the virus became prevalent, online assessments had been less practiced both in formative and summative modes. This may have been due to issues of legitimacy, reliability, and untruthfulness.

There are officially three epidemic waves that hit the country Pakistan in the past two years. During the first wave, educational institutions were closed from February to September 2020. In the second wave from November to December 2020, schools were closed, and during the 3rd wave, schools were closed from mid-March to May 2021. At the beginning of this year, the Omicron virus came, leading to a short-term 4th wave. After the lockdown, schools reopened in different stages for all grades. Throughout the first pandemic wave, schools remained closed for a long period of seven months, impacting 40 million students in Pakistan and affecting 95% of the global learner population. All of these scenarios have had a significant impact on candidates. The

dropout rate has increased, caused by mental health, social, economic, and psychological issues. It has also created issues for students, parents, schools, and teachers to adopt the new learning mode (online). As reported by Crawford et al., (2020) in today's world, because of COVID-19 intensified responses, thousands of students are constrained to adapt to online assessments rather than face-to-face examinations (for example, exams conducted on the Zoom app or Google Meet app with unmute microphones and switched cameras on). As a consequence of this plague, the immediate first action taken in higher education was to suspend examinations in many countries. However, if the pandemic cannot be stopped, or any other sudden calamities/emergencies happen in the future, we need to think about performing alternative methods of assessment more urgently or either move to adopt an online examination format.

In the past, numerous research studies have been conducted in the e-assessment area. According to Bakhsh et al., (2015) online assessment is still in the early stages of development and implementation in educational institutions throughout the South East Asia region, including Pakistan. The primary and essential needs of every educational institution, such as teaching students with efficiency and effectiveness, and completing their academic syllabus on time, currently face major challenges. In this situation, research has been conducted to determine the difficulties faced by administration and students in the implementation of online assessment. The study discusses the following issues: economic, technological, academic, moral, and social aspects, all of which affect the successful execution of formative online assessment. To determine the efficacy of online tests, they need to be implemented with other practical assessment types to make the overall academic learning experience beneficial for students. A study conducted by Ogange et al., (2018) aimed to gather information about students' perceptions related to

online assessment. The resulting findings showed that online assessment is a flexible and immediate feedback mechanism.

An effective combination of online learning settings with formative assessment provides a reasonable association for continuous significant efforts between students and the instructor. This system supports the advancement of educational networks to empower online instructions and their evaluation. This can convey an efficient course of action for successful student support through continuous observation of learning and the arrangement of sound online formative feedback (Sorensen & Takle, 2005). Due to the uncertain surrounding conditions or emergency situations, the whole learning setting suddenly shifted online globally in all educational institutions. Such serious situations require an assessment method that meets the set standards and benchmarks of academic assessment and is also authentic, impartial, valid, and workable. For that purpose, it is necessary to analyze the virtual, emotional, and intellectual environment of online formative assessment in tertiary-level education and compare the demographic variables (sector, gender, and residential area). Are all these environmental factors supportive or not for online formative assessment during emergency situations at the higher education level in Islamabad Capital Territory of Pakistan and also to find out the experience of teachers and students about online assessment? Therefore, in the future, researchers and higher education authorities should improve online formative assessment environments to make this more feasible and efficacious, especially for higher studies. For that reason, this study has been carried out by the scholar.

1.2 Rationale of the Study

Over the past few years, particularly in Pakistan, people and institutions have faced two scenarios. Firstly, there has been a high ratio of uncertain natural catastrophes,

and secondly, there has been a gradual increase in man-made emergency situations in the surrounding areas. Day by day, everyone listens to news about mishaps such as COVID-19 cases, natural calamities like floods, storms, earthquakes, dengue virus, public strikes, shutdowns, etc. Even in many nations, severe measures have been applied, but no one has been able to completely control these circumstances. This has caused numerous difficulties in different organizations of any country, including Pakistan, such as the closure of educational institutions and the incomplete coverage of the curriculum. The majority of formal universities or colleges that coordinated degree programs through online mode faced challenges in online assessment handling, which questioned their credibility. Not only has regular academic testing been affected, but also the placement testing system has been suspended or transferred online, for example, the International English Language Testing System (IELTS), as stated by Gamageet et al., (2020). Hence, it is difficult for learning/testing institutes to meet set assessment standards/benchmarks, which has created doubts in the minds of students, parents, and other users related to the quality of evaluation performed by these organizations. They are also questioning whether the online assessment platforms' environment provided to the audience by educational authorities is supportive or not during such a time period.

Previously, a number of research studies were conducted in the Pakistani context where scholars mostly discussed the benefits and challenges of online learning, assessment, and its practices. They explored how COVID-19 affected the education system, the influence of shifting from on-campus to online learning, students' satisfaction rates about formative e-assessment, their perceptions related to the impact of blackboard formative assessment, and online education in public universities. Medical and health science students' experiences regarding online formative assessment were also studied. However, no research has been conducted to compare public and private sector

universities, male and female candidates, or to investigate the quality provision of online formative assessment in urban, rural, and suburban residential areas.

Several prior research examples are mentioned here, such as Ahmad (2021) study, which analysed formative assessment practices in public sector universities in Pakistan. Data was collected from university administration, teachers, and students using interview and focus group discussion methods. The results revealed that teachers were unaware of the criteria for conducting formative assessments, which reduced the tests authenticity. There were no proper guidelines or rules provided to instructors. The gap identified by the researcher was the absence of information on online formative assessments, and private sector universities were not included for comparison in this study. Sharmeen and Siddiqui (2022) explored the challenges of online assessment by studying the perspectives of university students in Pakistan. The findings showed that both teachers and students faced difficulties while attempting online exams during COVID-19 due to technical issues, financial constraints, and social structures. However, the study focused solely on the drawbacks and ignored the benefits of online assessment for students and teachers.

At Agha Khan University, scholars conducted a study to check the quality assurance of an online open-book formative examination for undergraduate medical students during the pandemic by analysing the marks they received. The results were found to be reliable, and it was concluded that this online assessment strategy could be applicable in emergency conditions as an alternative to on-campus examinations with training (Rehman et al., 2022). However, the study's limitation is that it only included medical students and not those from the social sciences. Another study was done to assess the educational environment of an undergraduate school in Pakistan using mixed-method research outcomes. The results showed that students' perceptions of teaching were

negative, whereas their opinions regarding academic learning, social life aspects, and administration control were positive (Ahmad et al., 2019). Nevertheless, this study did not discuss online learning and assessment environments.

In addition, no studies have been conducted to analyse the online formative assessment environment, with a focus only on the academic environment and the environmental impact assessment process/system in Pakistan (Nadeem et al., 2008). Preliminary studies have not investigated three environmental factors, virtual, emotional, and intellectual, in relation to both on-campus learning and online education. Therefore, this study aims to address these gaps by analysing the environment of online formative assessment and comparing gender, sector, and residential areas during online assessment at the higher education level, with a particular focus on students of the Social Sciences Faculty. Additionally, few prior studies have mentioned teachers' and students' experiences related to online assessment. This study aims to highlight the experiences of learners and educators from universities in Islamabad Capital Territory.

Female students, like their male counterparts, experience a range of difficulties during online assessment. For instance, females in certain regions or from specific socio-economic backgrounds may have limited access to computers, reliable internet, or necessary software and devices, making it challenging for them to effectively participate in online assessment. They may struggle to balance the flexible timing of online assessment with household or caregiving responsibilities, which may be more prevalent among female students and prove to be a significant challenge. Moreover, some female students may feel less comfortable speaking up in virtual classrooms or discussion forums due to concerns about being judged or interrupted, and this impact their participation and overall learning experience. Technical glitches and issues disproportionately affect female students, particularly if they lack the technical support or knowledge to resolve these

problems quickly (Shaiba et al., 2023). Thus, it is vital to investigate the hurdles that female students experience during online formative assessments in Pakistan.

Every educator considers online formative assessment to be flexible in terms of location and time. Instructors use stored test papers or content at any time and even reuse them multiple times without creating new ones. Online classes also help to reduce costs related to physical class expenditures and on-campus examinations. In western countries, online assessment has been a part of their academia for years and is becoming more advanced day by day. Initially, learners from every part of Pakistan expressed resistance to this new format. However, as awareness increased and no other options became available, they adapted to it. Despite this, the quality and credibility of online assessments remain highly doubtful for everyone (Saleem et al., 2021). Therefore, it is essential to check institutions' services in terms of online assessment.

In Pakistan and around the world, an emerging trend is to study online and conduct online assessments, both formative and summative. Examples of this trend include entrance exams for admission, military training exams preparation (CSS, PMS), and certification exams by professional groups (IELTS indicator, TOEFL iBT home edition). Additionally, a number of online courses or assessment methods have been introduced with certification in the past few years, such as Coursera, Udemy, edX, and others. However, there is not enough research done in this area. Online assessment is a new approach in the education sector, as well as in health, psychiatric, and psychological areas, as assessments are now being performed digitally. In this situation, formative online assessment plays a crucial role in checking students' learning and assigning grades for promotion to the next semester/class. Therefore, there is a need to analyse the environment of formative online assessment at the higher education level, and to

understand the experiences of both students and teachers during difficult times in formative online assessment at higher studies. From the results of this study, universities' management staff and teachers may be able to create a more supportive online assessment environment in the future.

1.3 Statement of the Problem

Higher education institutions, such as universities, have been constantly switching between online and offline learning/assessment modes for the last few years due to various reasons, both natural and man-made, including the COVID-19 outbreak, dengue virus, strikes (announced or unannounced), natural calamities (floods, storms, earthquakes, etc.), public shutdowns (transport services, institutions/schools, businesses, factories, etc.), and instability in government, especially in Pakistan. In such circumstances, everyone, especially students' parents, was worried and questioned the quality of education and online assessment credibility. Hence, the role of assessment was more essential than before in achieving students' learning outcomes, addressing future concerns related to degree transfer, maintaining education quality, and achieving a set benchmark of the teaching-learning process, as stated by Eaton (2020b) other educationists and researcher also agree with author statement. Although everything was transferred from face-to-face (f2f) to digital/online platforms due to the pandemic, Pakistan's education system organizations never used technology as the main component in assessment, except in some institutions as an entry test before COVID-19. Consequently, the quality of online assessment was uncertain at all levels, from primary to tertiary. While formative assessment is crucial for student learning and academic success, there is limited research done on how to effectively conduct formative online assessments in the context of higher education in Pakistan because of unclear guidance from higher educational authorities. The lack of effective strategies for formative online

assessment in higher education during crises time periods in Pakistan hinders the quality of education and student learning outcomes.

Therefore, the aim of this study is to analyse the environment of formative online assessment at the higher education level, based on three selected factors: virtual, emotional, and intellectual, and to compare demographic variables. Additionally, the researcher studied the experiences of teachers and students related to formative online assessment at higher education institutions and explored ways to improve the quality and efficacy of online formative assessments to enhance student learning and academic achievement. The scholar applied a mixed-method approach, incorporating both qualitative and quantitative research methods. Data were collected through a survey questionnaire and structured interviews with students and faculty members from different higher education institutions in Pakistan. The collected data were analysed using statistical methods and content analysis. The findings of this research provide insights into the efficacy of formative online assessment practices in higher education institutions in Pakistan. The research also identifies the benefits and challenges faced by students and faculty members in implementing these practices during formative online assessments in higher education institutions in Pakistan. Overall, the research contributes to enhancing the quality of education and improving student learning outcomes in Pakistan.

1.4 Research Objectives

1. To analyze the environment of formative online assessment at higher education level.
2. To explore the experiences of university students regarding environment of formative online assessment at higher education level.

3. To explore the experiences of university teachers regarding environment of formative online assessment at higher education level.
4. To compare the experiences of students regarding formative online assessment on the basis of different demographic variables (sector, gender, and residential area).

1.5 Research Questions

1.5.1 Quantitative Research Questions

These quantitative research questions are related to research objective 1.

RQ1. How efficacious is overall environment of formative online assessment at higher education level?

RQ1a. How much efficacious is virtual environment for online formative assessment at higher education level?

RQ1b. How much efficacious is intellectual environment for online formative assessment at higher education level?

RQ1c. How much efficacious is emotional environment for online formative assessment at higher education level?

1.5.2 Qualitative Research Questions

Following qualitative research questions are related to research objective 2.

RQ2. What benefits are experienced by university students in relation to formative online assessment at higher education level?

RQ3. What challenges are experienced by university students in relation to formative online assessment at higher education level?

Following qualitative research questions are related to research objective 3.

RQ4. What benefits are experienced by university teachers in relation to formative online assessment at higher education level?

RQ5. What challenges are experienced by university teachers in relation to formative online assessment at higher education level?

1.6 Null Hypotheses of the Study

These null hypotheses are related to research objective 4. The first four main and sub null hypotheses are sector based.

Ho1. There is no significant difference in the experiences of public and private sector universities students on account of overall environment of formative online assessment.

Ho1(a). There is no significant difference in the experiences of public and private sector universities students with reference to virtual environment for online formative assessment.

Ho1(b). There is no significant difference in the experiences of public and private sector universities students with respect to intellectual environment of online formative assessment.

Ho1(c). There is no significant difference in the experiences of public and private sector universities students with regard to emotional environment for online formative assessment.

The next four main and sub null hypotheses are gender based.

Ho2. There is no significant difference in the experiences of male and female students on account of overall environment of formative online assessment.

Ho2(a). There is no significant difference in the experiences of male and female students due to virtual environment of formative online assessment.

Ho2(b). There is no significant difference in the experiences of male and female students caused by intellectual environment of formative online assessment.

Ho2(c). There is no significant difference in the experiences of male and female students because of emotional environment of formative online assessment.

The last four main and sub null hypotheses are residential area based.

H_o3. There is no significant difference in the experiences of urban, suburban and rural areas students on account of overall environment for online formative assessment.

H_o3(a). There is no significant difference in the experiences of urban, suburban and rural areas students with regard to virtual environment for online formative assessment.

H_o3(b). There is no significant difference in the experiences of urban, suburban and rural areas students owing to intellectual environment for online formative assessment.

H_o3(c). There is no significant difference in the experiences of urban, suburban and rural areas students due to emotional environment throughout online formative assessment.

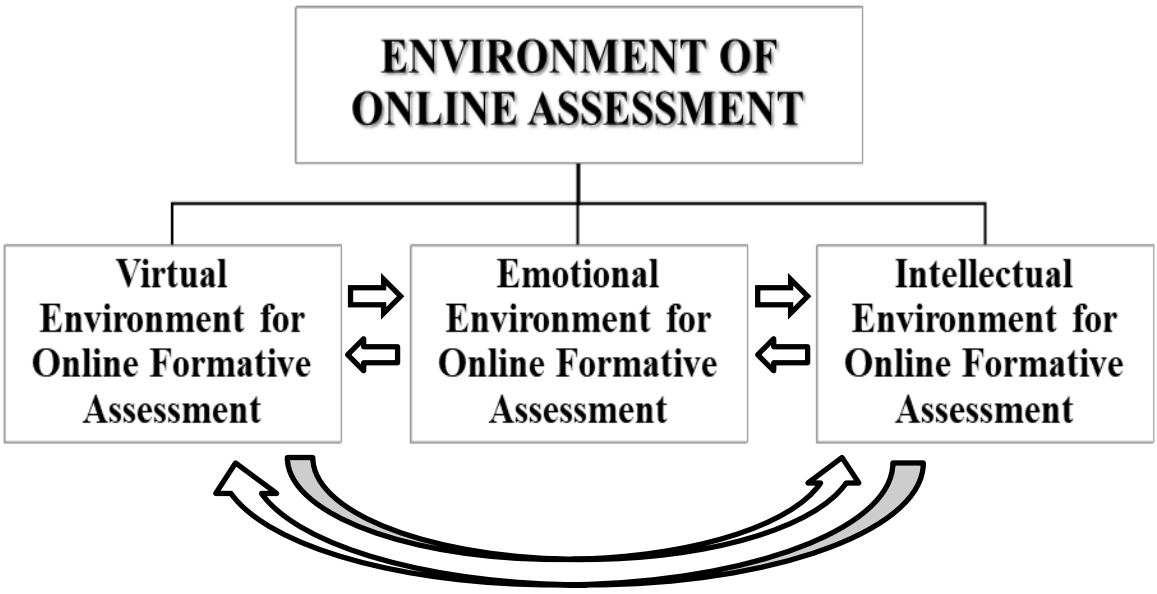
1.7 Theoretical Framework

The Supportive Online Assessment Environment (SOAE) theoretical framework is based on the work of Thompson and Wheeler developed in 2010. It has three dimensions which are virtual, emotional and intellectual. The researcher used these three dimensions (process indicator) to analyze the environment of formative online assessment at the higher education level. In each measured variable, there are sub-themes (act as a theoretical coat hanger); the researcher developed survey questionnaire statements from these themes to collect data from university students, then perform analysis and explain the results.

Framework elements have guided the building of the foundation for study research through the formation of research questions, hypotheses, and methodology. In this framework, scholar (author) reviewed literature related to supportive online learning environments, extracted common elements from that literature, and designed a helpful framework for online assessment environments. This structure contributes to the planning, advancement, and improvement of online assessments, whether formative or summative, without creating any difference in implementation.

Figure 1.1

Supportive Online Assessment Environment (SOAE) Framework



Note: Supportive Online Assessment Environment (SOAE) Framework adapted from (Thompson and Wheeler, 2010)

1.7.1 Virtual Environment for Online Formative Assessment

The first component that this study focuses on is the virtual environment, which includes various things such as network and Wi-Fi connectivity, availability of computer laboratories, quality and quantity of information technology tools, network speed and efficiency during online formative assessments, proper functioning of the Learning Management System (LMS), online assessment size and design, proper technological setup for all teachers and students (including private computer/device setups), provision of technical support and training to students/teachers, evaluation setup, user-friendliness, online materials and tutorials, site navigation, teacher accessibility to students, a distraction-free platform with electricity availability, efficiency in terms of time and money, etc. To ensure appropriate functioning, immediacy, and quality of the virtual environment, teachers and students may be provided with necessary training through

technical devices to enhance their skills during online formative assessments. To cover these factors, 14 survey questions were developed and filled by students in this research study.

1.7.2 Emotional Environment for Online Formative Assessment

The third element of the supportive assessment environment framework is an emotional environment for formative online assessment, which includes anxiety levels, confidence, comfort, and self-trust in our own abilities, all within the online system of assessment. In today's uncertain situation, technology adoption is necessary. Students have confidentiality in the online system, so learners must take responsibility for their education with a positive learning attitude. Teachers provide emotional support by setting high expectations for students, providing skills training, resolving issues through online communication as mentors, and appreciating outstanding performers. This includes netiquette, requiring both teachers and students to adhere to online behaviour rules for a fair assessment environment. Lastly, students' time management is crucial. Students filled out these 13 survey items to analyse the online formative assessment environment.

1.7.3 Intellectual Environment for Online Formative Assessment

The second element of the framework is related to intellect, where students engage in critical and reflective thinking processes and gain an understanding of complex ideas. The following subthemes are presented in this component for students: preparation time in a supportive online assessment environment, activity reminders, teacher’s feedback on student practice tutorials, and the use of reflective thinking, problem-solving, and critical thinking skills to enhance learning. Self-assessment and peer assessment are used to create a learning culture. Monitoring and active involvement in all activities promotes independent learning and emphasizes question-answer-based learning. Students

who have a good academic learning environment also consider their learning goals, have clarity of outcomes, and receive clear instructions. Is the teacher audible and do they use online resources in their teaching style? Eighteen survey items were developed from the sub-themes of this dimension to understand students' intellectual environment for online formative assessment at the higher education level.

The connection between the virtual, emotional, and intellectual environments during online assessment is complex and multifaceted. Each of these elements plays a significant role in shaping the overall experience and outcomes of formative online assessments. Additionally, the interconnection between all these elements is very necessary for the successful operation of an online formative assessment environment. The virtual environment influences the emotional environment. If the online assessment platform is user-friendly and reliable, it reduces anxiety and frustration. Conversely, technical issues or a poorly designed interface lead to stress and distraction. The emotional environment impacts the intellectual environment. Emotional states like anxiety or confidence affect cognitive processes such as memory retrieval and decision-making, which are essential for performing well on intellectual tasks. The intellectual environment influences the emotional environment. If the assessment content is perceived as fair and relevant, it contributes to a positive emotional state. Conversely, if the assessment is perceived as biased or unfair, it may lead to frustration or anxiety. To create effective online assessments, it's crucial to consider all three environments and strive to optimize each one. This may involve using user-friendly assessment platforms, providing clear instructions, minimizing bias in assessment content, and creating a supportive and encouraging atmosphere for test-takers. Ultimately, a harmonious integration of these environments leads to more valid and reliable assessment results (Martin & Bolliger, 2018).

1.8 Significance of the Study

The study is significant for policymakers (universities' administration) and the Higher Education Commission because they may now be aware of how efficacious their formative online assessment environment is for both students and teachers. They may receive feedback from students and teachers regarding their formative online assessment approach based on gender, sector, and residential area. They may recognize the strong and weak points of each environmental factor mentioned in formative online assessment systems, which are virtual, emotional, and intellectual, by comparing these dimensional elements with gender, sector, and residential area. They may become aware of the benefits and challenges experienced by both teachers and students during emergency situations through this assessment method. Afterwards, the institutions or higher educational authorities may find solutions/remedies, make advanced technological modifications, and attempt to improve their online learning platforms.

Teachers might understand how efficacious the formative online assessment environment is for students' learning and improving candidates' grades in summative evaluation. Teachers might know which elements or sub-themes of a supportive online assessment environment need more attention for improvement, be it virtual, intellectual, or emotional. They may instinctively get their online teaching style feedback/review report from students that might help them improve their online testing/teaching methodology. Additionally, teachers also get the opportunity to share their experiences related to formative online assessment environments.

The benefit to students is that they might convey their point of view or share their experiences, which belong to diverse demographic areas, with high education authorities such as universities administration or the Higher Education Commission. The researcher

might receive responses/comments from students and compare/analyze the performance of both private and public sector institutions. As a result, high-tech academies' supervisory staff might learn how to improve the formative online-assessment environment, which will help enhance the online assessment process for universities in both sectors in the future. By obtaining feedback from students, university management might make efforts to introduce a technologically advanced or user-friendly environment for conducting online assessments. This research is a valuable addition to the existing literature.

1.9 Methodology

1.9.1 Research Design and Approach

In this study, the concurrent triangulation mixed-method design was used to make the results more appropriate and authentic. The researcher analysed the environment of formative online assessment based on a supportive online assessment environment framework using a mixed-method approach. Additionally, the experiences of both students and teachers regarding formative online assessment at the higher education level were narrated. In this design, both qualitative and quantitative data were collected simultaneously but separately. Furthermore, the data analysis process was conducted separately for each type of data. Finally, the results of both data sets were compared.

1.9.2 Population

All the students and teachers belonging to the Faculty of Social Sciences constituted the population of the study. The researcher selected three public and three private universities offering common programs/departments of Social Sciences. The researcher used stratified random sampling technique with equal size/number of groups

and strata were developed on the basis of sector. The total undergraduate-level students' population of four departments (Economics, Mass Communication, International Relations, and Psychology) was 5362. The total undergraduate-level teachers' population of four departments was 169.

1.9.3 Sampling Techniques and Sample Size

The first sample of respondents consisted of 370 undergraduate/bachelor-level students selected using the stratified random sampling technique to complete the questionnaires.

The second sample of respondents comprised seventeen (17) university teachers selected through the convenient sampling technique to answer structured written interview protocol form questions.

1.9.4 Research Instrument

The questionnaire was used to explore the online assessment environment. It contained both closed and open-ended questions and followed a four-point Likert scale (strongly disagree-1, disagree-2, agree-3, and strongly agree-4). The questionnaire consisted of three major sections: the first part contained demographic information, the second part consisted of items related to the environment of online assessment (including virtual, intellectual, and emotional environments), and the last part had two open-ended questions. The structured written interview protocol was adapted from Rowley (2019) and contained seven questions to gather information about teachers' experiences with formative online assessment at the higher education level.

1.9.5 Data Collection

The structured written interview protocol questions were used to collect data from seventeen university teachers. The questionnaire was filled out by 370 undergraduate-level students from six universities offering common programs/departments in Social Sciences. The researcher personally visited the universities for data collection.

1.9.6 Data Analysis

The questionnaire data was analysed using descriptive statistical analysis (frequencies and percentages) and inferential statistical analysis (Independent sample t-test and one-way ANOVA). The data from the last two open-ended survey questions in the questionnaire and the interview protocol were analysed using thematic analysis.

1.10 Delimitations of the Study

The study has been delimited to:

- Six universities of Islamabad Capital Territory offering common programs/departments of Social Sciences.
- Students and teachers of undergraduate level.
- Environment of formative online assessment.
- Three factors of the environment which are virtual, emotional, and intellectual.
- Questionnaire and interview protocol.

1.11 Operational Definitions

1.11.1 Formative Online Assessment

Formative online assessment refers to the assessment for learning, by using ICT during the teaching process to evaluate theoretical knowledge, assess students' academic progress, and provide feedback to both students and teachers. For example,

online quizzes, online discussions, online presentations, student virtual conferences, virtual labs, games, case studies, reflective journals, etc. can be used for formative online assessment.

1.11.1.1 Environment

The environment is defined as an off-campus academic platform built in a suitable surrounding setting that drives effective teaching and learning processes, as well as motivates and influences students' growth in emotional, social, and intellectual aspects.

1.11.1.2 Virtual Environment

A virtual environment is a suitable use of ICT materials that provides online (digital/web-based) platform availability for handling learning and formative online assessment, e.g. a Learning Management System (LMS), technological setups/expedients, computer laboratories, online resources, online tutors, etc.

1.11.1.3 Intellectual Environment

The intellectual environment is referred to as all the things that build students' cognition/intelligence during formative online assessment e.g. feedback, practice, reminder activities, self, and collaborative learning, monitoring learning culture, etc.

1.11.1.4 Emotional Environment

The emotional environment refers to the entire range of feelings and sentiments experienced by students during online formative assessments, including anxiety, confidence, positive attitudes towards learning, confidentiality, and high expectations.

1.11.2 Efficacious Environment

Efficacious environment is defined as an effective and productive environment that helps students to achieve desired or intended learning outcomes.

1.11.3 Inefficacious Environment

Inefficacious environment is defined as an ineffective and non-productive environment that hinders students to achieve desired or intended learning outcomes.

1.11.4 Urban area

Urban areas are referred to as cities due to their good infrastructure, which provides students with the necessary off-campus or virtual academic equipment they need.

1.11.5 Suburban area

Suburban areas are often referred to as towns and frequently lack proper infrastructure, which makes it difficult for students to access high-quality online learning platforms and resources.

1.11.6 Rural area

A rural area means villages/remote areas (absence of quality infrastructure) where students are not facilitated with basic essential online learning gadgets.

1.12 Chapters Breakdown

1.12.1 Chapter One

The first chapter of the dissertation discusses the introduction of formative online assessment at the higher education level. The researcher included the following headings: background of the study, problem statement, rationale of the study, significance of the study, research objectives, research questions, null hypotheses, research methodology, theoretical framework, operational definitions of the main terms in the research thesis, delimitations of the study, and breakdown of chapters in the research study.

1.12.2 Chapter Two

The second chapter includes a literature review. In this chapter, the researcher added a review of the literature from various internet sources such as blogs, journals, books, articles from Google Scholar or Web of Science, etc. The information included in the literature review is not older than 15 years. The researcher then developed headings and subheadings related to the research topic, such as the history of assessment, definitions of main research terms with explanations, models that support the framework, relevant researches and assessment in Pakistan.

1.12.3 Chapter Three

Chapter three, related to the methodology of the research, includes the following: a detailed description of the research design, research approach, participants of the study, data collection instruments, survey questionnaires and interview protocols, validation and reliability of survey questionnaires and interview protocols, ethical considerations, data collection procedures, analysis of data, and demographic information of participants.

1.12.4 Chapter Four

The fourth chapter is associated with the results and their analysis. There are three parts to the data analysis. The first part contains quantitative data analysis, including

questionnaires. The analysis is done through descriptive and inferential statistical analysis. The second and third parts contain qualitative data analysis, including analysis of interview protocols and open-ended survey questions. The analysis involves completing a thematic analysis through the use of themes and coding.

1.12.5 Chapter Five

The fifth chapter contains a summary of the findings, discussion, conclusions, and general recommendations. It also includes future recommendations for new researchers who want to conduct research in that area. Lastly, the chapter discusses the limitations that the researchers faced throughout the entire study.

CHAPTER 2

REVIEW OF RELATED LITERATURE

The second chapter of the research study is consisting of review of related literature in which researchers initiate analysis of the previous scholars' work in the specific study area ‘formative online assessment at higher education level’ to support or justify the current study work. In this review writing the scholar studied and also noted down 15 years old research work in the assessment area starting from 2007 up to 2022. In the present study, the researcher follows a thematic or topical order literature review pattern (which means mentioning a broad topic or issue then forming a relationship between subtopics and narrowing it down toward the main topic or issue) or where the discussion on topics begins from a broader perspective then moving toward specific one related to thesis title or study area. Therefore the analysis of assessment is instigated from its history and evolution from time to time basis in the education sector.

2.1 History of Assessment

Brink, (2011) indicated the overall historical perspective of assessment. Thusly the history of testing began in 2200 B.C (before the crest) when the Chinese used competitive exams to hire people for different civil service positions such as geography, agricultural revenue, civil law, and military affairs. The test was very tough only 3% of people were eligible for public office positions. Europe and America follow the footsteps of the Chinese and brought exams into their system in the 1800s. In the 19th century, formal work started on measurement and evaluation by the western education system. Wundt, Galton, and Cattell contributed in that sector to set the foundation of 20th-century testing. Wilhelm Wundt studied the human mind in his psychological laboratory under standardized conditions which was important in test administration. Galton studied the

individual differences in mental abilities of people using psychological testing. In the period 1860-1944 Cattell invented the term mental test, at that time scholars' abundant sensory discrimination was a measure of testing someone's abilities. Hereafter evolution takes place through standardized achievement and intelligence tests. In 1905 French government asked psychologist Alfred Binet developed a test to detect school-going French kids in Paris who could not benefit from regular teachings and needed specialized assistance. Binet with his colleagues developed questions focused on attention, problem-solving skills, and memory. After testing students with these questions he concluded that some children answer questions like having advanced knowledge whereas other children of the same age/class responded averagely to those questions. Binet recommended 11 tests of mental age based on his study findings called the Binet- Simon scale intelligence test.

Stanford university psychologists of the United States 1916 adapted the original Binet test by using American participant's samples standardized it then modify its name to called Stanford-Binet Intelligence Scale. The boom period of testing originated from World War 1. When the American Psychological Association president order the selection of candidates for military service done via standardized testing such as army alpha (verbal) and army beta (non-verbal) was conducted by Yerkes for almost 12-15 years to allot assignments to soldiers according to their individual abilities. At the later end of the war, tests continued in used for various purposes. After that during World War 2 1920-1940 vocational and personality tests (paper-pencil tests) were developed. Onward the 1930s, first period of criticism commenced on these types of tests because it created colonization, discrimination, or categorization of people on the bases of racists, language barriers, and nationalities. Disapproval led psychologists to review these tests. Later in the 1940s test batteries were developed by psychologists to again measure

abilities for military service selection. By the 1950s after setting some guidelines to promote good practices psychological testing grow into various fields, for instance, education, business, industry, clinics, etc. at 1955 another specialist Wechsler published thirteen new intelligence tests named as Wechsler Adult Intelligence Scale (WAIS). In 1965 due to the civil rights movement, second period of criticism started because these tools were considered biased that invaded people's privacy. Overlooking all these criticism ages of accountability initiated, all governments' sectors especially educational organizations were continued examination practices to check whether they achieving their objectives or not.

Sambell et al. (2012) mentioned the brief history of testing in the education sector as follows. The assessment started when schools were first opened. Early 19th century teachers administered tests to evaluate learners' performance for deciding the up-gradation of them. One type of test given to the whole class was called recitation (Giordano, 2005). Today such a type of test exists in every institution refer as a summative assessment. When founding the field of educational psychology in the 20th century. According to Giordano, (2005) organizations were completely change testing services by familiarizing students with standardized tests built by psychologists. It became the norm for objective measurement of content knowledge and students' intelligence. Shepard (2019) called that a scientific measurement because these tests were all about the judgment of learners 'mastery of content, level of aptitude' and potential of getting higher education however not used for accountability. Subsequently the mid of 20th century from 1960 onwards main purpose of the testing was accountability, based on the results of standardized tests students' proficiency was determined. In 1967 the term formative assessment was firstly introduced by Scriven. By 1989 its definition was proposed by Sadler. The member of the well-known educationist scholars group Caroline

Gipps was credited for giving a new name to this term which was assessment for learning then in 1994, he introduced the term to the wider community of education. Presently, the concept of standards-based accountability was completely treading (Linn, 2006).

Ewell and Cumming, (2017) stated the beginning of assessment as follows, founding period phase I; in 1984-85 report published like Integrity on the College Curriculum by Association of American College (AAC, 1985) and to reclaim a legacy of educational testing service scholar discuss concerns regarding the need to form curriculum experience that monitor pupil knowledge and progress. Therefore In the fall of 1985 first National Conference on assessment in higher education was held in Columbia, South Carolina where the assessment of learning was presented as a form of "scholarship. During phase II in 1990, external bodies bring pressure on private sector institutions to merge assessment into their programs. By 1993 assessment was considered a recognizable practice everywhere and its ratio was risen up to 98%. For future phase planning concentrate on improving the productivity of learning from k-12 institutions and acknowledge evaluation as an unavoidable part of doing advanced schooling business. When the twenty century had been at the end just basic numeracy, literacy, and content knowledge was not enough, technology brings a revolution in undergraduate instruction. For meaningful higher studies reform begins a new period as the 'test century' where assessment accountability had become a necessary condition hence its position had to be sustained. Afterward explaining the history of assessment researcher moves toward defining the following terms on which the whole study was based.

2.2 Formative Assessment

Formative Assessment is considered as action of assessing/evaluating during the learning process. it has a number of advantages first of all help student to learn and

practice better, provide feedback to both instructor and learner, give proper direction to instructions, identifies misconceptions, and give guidelines, it is also called formative feedback, formative evaluation, and assessment for learning. A huge number of researchers work in this field and describe it in detail one of them is given here. According to Black and Wiliam (2009) formative assessment is "all those activities performed by teachers, or by their students, which is helpful in getting information then provide feedback to both teacher and student, as a result, they improve their teaching and learning activities in which they are already engaged". They also stated that teachers should practice formative assessment in classes thus they get data and then interpret it, and finally provide evidence related to student achievement. This data is used by both teachers, and learners to make decisions for the betterment of their instructions and learning process in day-by-day classroom activities. Therefore practices of formative assessment in the classroom facilitate the learning process; both teachers-students get feedback continually and they improve or accelerate their teaching-learning process.

Black &Wiliam (2009) formative assessment has numerous advantages in terms of locus of planning classroom activities and building strategies for student engagement and self-assessment that help out learners in taking responsibility of their learning. A well-design formative assessment is effective in increasing student achievement, and also helpful for those students with special needs e.g. learning disabilities. As reported by two research studies conclusion (Stiggins 2005; Black and Wiliam, 2009) formative assessment is essential and useful in all education settings, it can be valuable in getting content area knowledge (cognitive skills), having learning expertise in psychomotor and effective skills in all educational level from primary to tertiary. These researchers proved in their studies by using experimental or different study methods that any type of assessment especially formative assessment results in a high academic achievement rate

for students. The formative assessment brings positive change in student academic achievement. Due to entire this researches conclusions/evidences, the researcher also agree that the use of formative assessment is very helpful in increasing/improving students' academic performance. In the next heading researcher defines online assessment.

2.3 Online Assessment

Gaytan and McEwen (2007) online assessment is defined as judgment of students cognitive abilities, academic performance, and actions. This test is administered over the internet by using existing network technologies (Information Communication Technology). In today's world online assessment is used in all fields like education, health, and psychology also. There are a number of strategies to conduct online-assessment for example well explaining assignments given by teachers to students on regular and weekly bases, then providing timely meaningful feedback to students that helps in improving their work quality. Effective online assessment practices are e-projects, e-portfolios, self or reflective assessment, peer or group evaluation and viva, etc.

Akyol et al. (2009) stated that it is very difficult task to develop efficient online learning communities where meaningful interaction takes place between students and teachers through an online setting because presently educators are unaware of well-organized online teaching strategies but in the future, it can be possible. To integrate formative assessment in online learning environments by creating meaningful tools and techniques that are helpful during communication between teachers and students in a well-sustained environment thus also contributing to increasing the development of effective learning and its assessment method. These online assessment techniques also facilitate critical thinking skills which are part of the higher order thinking skills of

bloom's taxonomy. Online assessment plays major role in socio-cognitive skills formation in students by focusing on both areas like first building social abilities in students when they communicate with diverse (academic and geographic) backgrounds pupil. Also rising capacity to cover all stages of the cognitive domain during the evaluation and learning process. Thereafter researcher aware of both terms' definitions currently wants to look at how both assessments work together.

2.4 Online Formative Assessment

Gikandi et al. (2011) explained the term online formative assessment, as the introduction of developmental assessment that occurs during online learning, where teachers and students separate by time and location. A lot of academic instruction and learning processes are driven by online platforms. Pachler et al. (2010) defined formative online assessment as the utilization of information communication technology (ICT) to help the procedure of collecting, and analysing data about student learning/training by instructors and then assessing it in corresponding to earlier students' accomplishments and achievement of planned as well as unplanned learning outcomes. The study was conducted by (Gikandi et al., 2011) at the University of Canterbury New Zealand to check how formative assessment works within the online learning environment. For this purpose qualitative study was done at the higher education level to check the application of formative online assessment: different techniques were used by researchers for example e-portfolios, self-test quiz tools, online tests/viva, and assigned individual projects also within peers/groups. Findings show that these online techniques improve learner engagement, activate and developed learning community. In short formative online assessments give valuable feedback, learning experience and enhance learner engagement.

Baleni (2015) investigated how formative online assessment benefits both the teaching process and students' learning. For this study mixed method approach was used to collect data. Results show the number of benefits of this online assessment for example immediate feedback, less costly, improves student commitment, and online assessment enhances the flexibility of time and place. If concisely discuss formative online assessment significant in all its form and create a valuable learning experience for students. But it was also some disadvantages for example dealing with learning outcome coverage and trustworthiness. According to the study done by Olson and McDonald (2004) in American medical university to show the efficacious of formative online assessment and its impact on summative assessment also on student learning by conducting experimental research. In this experiment, students were divided into two groups. One group of students who took the formative online assessment exam scored 8.8% higher in summative exams than those group students who did not appear during practice exams in a medical science course. Thus this research finding proved that formative online assessment improves students' performance in final exams. From next heading researcher wrote down importance of different type of assessments.

2.5 Components of Formative Online Assessment

Online formative assessment typically includes several components to provide ongoing feedback and help learners improve their understanding and performance. These components can vary depending on the specific tools and platforms used, but here are some common components given by (Khairil & Mokshein, 2018).

Quizzes and Tests: Online quizzes and tests are used to gauge learners' understanding of the material. These assessments include multiple-choice questions, true/false questions, short-answer questions, and more.

Self-Assessment: Learners are encouraged to reflect on their own understanding and performance. This might involve self-assessment surveys, journals, or reflection questions.

Peer Assessment: Learners assess the work of their peers. This may be a valuable component as it provides different perspectives and encourages peer learning and collaboration.

Discussion Forums: Online discussion forums are used for formative assessment by encouraging learners to participate in discussions related to the course material. You may assess their contributions, understanding, and critical thinking skills through these discussions.

Assignments and Projects: Assignments and projects are designed in such a way that they are not only summative but also formative. Provide feedback on drafts or early versions of assignments to guide learners in the right direction.

Interactive Activities: Utilize interactive simulations, virtual labs, or other engaging activities that allow learners to apply their knowledge and receive immediate feedback.

Online Polls and Surveys: Use polls and surveys to gather feedback on specific topics or concepts, helping you gauge the overall comprehension of the class.

2.6 Importance of Assessment

At present everyone knows how assessment important is in today's world for the proper functioning of all fields. Just like that in the education system, its significance is not neglected. Therefore Taras, (2009) mentions various qualities of assessment as follows; exams are necessary for awarding students with degree or certificate and also for education standard maintenance. Testing plays major role in dividing/ ranking students on the basis of merit as well as to compare the abilities of different tutees. testing helps

out in analysing teachers' performance via looking at if learning/curriculum objectives are fulfilled or not, all these things are monitored by the administration to check institution progress and find its popularity in surrounding communities. Due to the grading system, good learning habits developed in students which are source of parents' happiness and satisfaction. Hiring companies use assessments to identify pupils' intelligence and then allot work depending upon their capabilities.

Tosuncuoglu, (2018) highlighted the significance of assessment for both teachers and students in such a way. Evaluation plays an important role for pupils in the process of acquiring knowledge. It set standards of discipline and the notion of equality among students. Instructors through formative testing determine the current level of students' skills and then improve candidates learning by using remedial teaching methodologies that connect their existing abilities with new information. Educators with the help of diagnostic assessment find out learning gaps between classmates by looking at their strengths and weakness and identifying separately academic difficulties of each individual. Annual academic Testing (summative) results assist teachers in deciding further instructional plan and higher administration also get help in policy-making for educational organizations. Tutors easily do learners screening (placement testing) then are able to do the classification of them on the basis of their learning style, and gardener theory of multiple intelligences. Because of assessment teachers are capable of decision making, classroom management, and getting understanding about setting SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) goals that provide evidence to the outsiders about the suitability/effectiveness of the course. The cumulative analysis informs a parent about their kid’s learning therefore they have confidence in the system. They support and are more involved with school authorities in planning learners' future progress. Institutions based on their academic performance build trust in the

community or higher organizations and gather funds for launching new projects. Researcher think, to accomplish these entire objectives the effective assessment method is crucial at all levels. Thus the question is how to make assessment effective? Researcher discusses some features that make online assessment authentic.

2.7 Characteristics of Authentic Online Assessment

Discussing the characteristics of authentic online assessment researcher cited the list of characteristics presented by knowable educational scholars. Most practical oriented ten strategies that denote the characteristics of online assessment given by Clarke, (2014) the list is mentioned below by the researcher:

1. Rich online formative assessment task quality is that it naturally connects with what the teacher taught to the students during taking regular classes.

2. One single assessment task covers the number of learning objectives and outcomes.

3. Online assessment task increases the engagement rate of students.

4. Online assessment tasks have the ability to administer or perform by using a series of approaches and methods successfully.

5. Task gives openness or freedom to students for solving the assessment activity according to their own choice.

6. Authentic assessment inspires learners to reveal their own knowledge and answer the questions of the task base on what they've found out or sum up from teacher lessons.

7. Genuine assessment helps out students in making connections between various ideas or conceptions they have found out in different standards or grades in the form of a schema.

8. The online assessment activities in themselves are worthwhile that enhance students learning.

9. Worthy formative online assessment tasks help out instructors in diagnosing students learning problems in specific subject areas that provide guidelines to teachers for further instructional plan designing.

10. Authentic online assessment introduces several methods in which students in the future might use their capabilities and knowledge based on their present understanding and preferred learning style.

Morgan and O'Reilly (2020) mentioned 10 key features that assessing open and distance learners, especially for better handling of online assessment, which need exceptional consideration in the educational assessment world. All ten points identified by the researcher discuss below:

1. For executing online assessment instructor, first of all, develops clear and coherent content and uses constant academic methodology.

2. Teacher clear or explain the value of that assessment by discussing its purposes, aims, benchmark, and standards of marking/grading to learners.

3. The online assessment tasks must be applicable, authentic, holistic, and relevant to the target topic.

4. Before taking an online assessment instructor aware of each candidate's academic background, level of learning, previous knowledge, and perceptions.

5. After completing the online test, the evaluator provides satisfactory and timely feedback to each student separately for their learning improvement.

6. The length and volume of online assessment are adequate for both students and teachers as task completers and an evaluator.

7. The structure of online assessment is facilitative to students not create any confusion.

8. The assessment should be that on which teacher able to provide grades on learner work and it’s certifiable.

9. Effective online assessment must be credible, sound, and reliable.

10. The purpose of an online evaluation is to non-stoppable candidates’ academic improvement and teaching subject quality enrichment.

Studying all these features of effective online assessment given by scholars prompts questions about our current assessment process such as whether what we assess is valuable to students in the future. Can we only assess those things which are measurable or visible to us? Looking at traditional evaluation methods teachers restrict by educational authorities and typical subject matter design to use quizzes, multiple-choice tests, essays, etc. as grading procedures on the other hand in today's online assessment phase, assess candidates on the basis of statistics of their time spent and a number of posts/chats in online forums. But these things only check their engagement rate not used as tools that measure someone learning progress. To support this argument Siemens (2006) stated that if we want to measure success based on measuring learner usage

statistics as a tendency, is the same as for program success we used to measure ‘bums in seats. In the same case now we relate course success/progress with the number of pupils registered in the Computer/Learning Management System (CMS/LMS) and statistics of page views by students. That rise queries if institutions only depict candidates to course content, can true learning happen. The important factor that influence learning is environment hence researcher continued literature study to know about this element.

2.8 Learning Environment

Movchan, (2018) defined the learning environment as a platform in which students interact and engage with each other to study advanced skills. Where beginners/novices are able to learn in range of surroundings, that is more accurate and ideal substitute for out-dated classrooms. This term is not just associated with classroom structure or setting but a place where students feel supported, safe, and get motivated by their surroundings for acquiring knowledge that help them in achieving their dreams. Currently, this term is the centre of focus, firstly because of technologies (ICT) used in the education sector and secondly due to constructivist learning. The learning environment has various meanings depending upon its use or setting such as learning task indicator in schools, sometimes focus on classroom psychological environments, presence of computer and internet facilities its indicates as virtual surroundings, etc. (Fulkerth, 2014). Numbers of studies done on learning environment that focuses on tutorial room tools (desks, tables, etc.) set up building students' motivation, teaching methods, management of behaviour, principles, and discipline of classrooms. Even including school room colour (Slavin, 2013).

Suitable learning surroundings help out students in finding solutions to their academic problems and also in achieving their professional goals; it provides access to all

required materials. Experience develops through the interaction between the learning environment and learner is very important for the lifelong learning process. All the material or tools available in the learning setting play fundamental role in students' development. A recent trend in education promotes that; materials should be designed according to the different learning styles of learners. Technology help, enhance and make an efficient learning setting where students' need is fulfilled and they get motivation for this purpose instructional technology is categorized as auditory and visual or both depending upon the situation. Vinales, (2015) the learning environment plays a key role in student education. In order to meet 21st-century proficiencies, it helps students develop their range of skills, knowledge, attitudes, and behaviours also provide essential exposure toward advance information for students. The various experimental and other studies done in this area, their results show that when designing learning environment if we consider candidates learning styles and activities that support learning, it positively affected their academic achievement (Dascalu, et al. 2015; Ozerem & Akkoyunlu, 2015). The present study is based upon the online system thus its description is necessary.

2.9 Online Learning Environment

Refers to the cyberspace environment where teaching and learning happen by means of computer-mediated communications and the Internet. This helps out institutions in sharing study materials with students by using different websites such as Blackboard, Moodle, Web Course Tools (WebCT), and Google Classroom, Where no physical space is needed for both instructors and pupils to continue their studies. That space is categorically symbolized and designed for educational interactions, where for co-constructing the virtual space students are enthusiastic (Ke & Kwak, 2013). Online learning environment builds connection between theory and practice during studies,

which helps in creating authentic and understandable assessment culture that drive effective teaching-learning process for everyone Benson and Brack, (2010). It has the capacity to fulfil the needs of pupils. Offer training and teaching regarding multiple levels and stages of independent living skills to those students who have special learning requirements Thornes (2012).

For solving real-world problems through demonstrating practical skills and application of knowledge, an online learning environment makes available various authentic problem-solving tasks for students to learn and instructors to explain (Litzinger et al., 2011). If we look at the emotional phase of pupils during online education Reio and Crim, (2013) stated that social presences from both teachers and students sides in an online learning environment increase students' satisfaction level of online learning experience and in conclusion predict that learners enrolment in online courses also increase at the maximum rate in future if we work on this factor. Dunlap, et al. 2016 mentioned that by the presence of text-based Electronically-Mediated Communication (EMC) instructors chat with students using different smileys and other emojis also showing emotions in the form of motivational physical gestures of hands (e.g. thumbs up, etc.), facial expressions (smile, head nodding in response to correct answers) all these activities increase and develop students good perceptions about social presence in online learning environments that play a part in enhancing their academic achievement.

Above cite all significances of virtual learning setting researcher conclude that this system gives educators the digital base solutions to each learner's problems by offering interactive learning scenarios. Instructors are able to do curriculum mapping, plan course content, lessons, store, and execute them very well. They make sure to be in contact with their students (e.g. emails, online discussions, chat, web publishing) through a proper channel which is learning management system. Help out teachers in student

tracking, managing resources, and building record of their performance. The system assigns special identification numbers to both teachers and students to access their functions. But instructors have accessibility to more features compared to learners like doing modifications and creating structure. There are various official online learning environment software obtainable for educational purposes such as Blackboard, Web Course Tools (Web CT), Lotus Learning Space, and Common Open Software Environment (COSE). Whenever talking about learning topic assessment is mandatory to come.

2.10 Online Assessment Environment

A virtual assessment environment means meeting learning curve head-on by using digital tools such as email, boards of discussion and also re-intellectualizing them to make online exam delivery more creative. Research also proves that collaborative assessment experience promotes comfort zone during online exam setting if use effective rubrics. (Perera-Diltz & Moe, 2014) Based on students' online education experience instructors assess their learning using technology. Therefore they know if delivering content meets learning objectives and where educator needs to put more effort. Thus the aim of exams is not just to evaluate learner academic performance and verify it but also to make improvements on both sides like refining lesson delivery and pupils' understanding (Dixson & Worrell, 2016). When forming online assessments using digital tools instructors do not think about how they assess students. Make exam accessible and equitable for everyone instead Morris, et al. (2021) advises that teachers question themselves, what am I teaching? In that case, we are able to focus on classroom pupils and how they understand things and express in the best way what they have learned. To

form productive online exam environment teachers must follow outcomes and guidelines of learning objectives.

Coyte, (2021) there are multiple strategies to make online assessment environment useful for consumers. The first step is constructively aligning every component from preparing lessons to evaluating learner performance. Make virtual assessment setting flexible and modifiable by ensuring that all components like intended learning outcomes, teaching method, and assessment are connected with the same goal of learning. The second thing that needs to be considered is installing confidence in students related to the use of computers and the internet during an online assessment. Before exam starts clearly state all rules, marks of each session, time, paper format, and the difficulty level. Especially in the initial semesters, online tests can be moved from simple to complex. Third phase is effective feedback which consists of three characteristics it can be personalized (specific), consistent and immediate. Feedback on answer sheets is more appropriate and authentic for students. Fourth technique is monitoring the learning analytics such as time taken to complete tasks by each individual, final online report in the form of bar graph distribution of student's grades. The educator can quickly build it and then store this for long time simultaneously for improving pupils' experience of online assessment setting and identifying their weak learning areas/points. Last check the accessibility of online exams for students and they know how to solve them. For such aim, web content accessibility guidelines should be followed (e.g. Options of conversion to different languages, swapping between text and image, keyboard navigation, etc.). Give proper training to novice before transferring their assessment to that online mode.

Due to the sudden change in assessment method from a physical setting to a virtual environment, students find out this frustrated and stressed because they are unsure about how educational institutions assess them which causes academic dishonesty

(DeWitt, 2020) suggested few approaches to make online assessment setting more user-friendly, comfortable that promote cheating free environment. First thing is to allow students to choose their assessment type/form and also decide their submission timeline just like developing presentations (in Voice Thread, PowerPoint slides), project-oriented assessment (in Click Up, smart sheet, kintone), role play (in Toonly, Doodly, Powtoon), develop info graphic (in canvas) and video Trailer formation (in iMovie). Second point we need to consider is authentic and small assessments should be taken. Students know what, why, how, and when they going to be assessed. It's related to their interest and passion. Third point is to trust students and gives alternative assessment options such as service learning, collaborative projects, and research projects rather than just only relies on quizzes and test to reduce cheating. Last thing is providing peer-to-peer feedback and continuously communicating with each other through Google forms, chat in Zoom/Team, discussion board in LMS/Voice Thread, online whiteboard, annotations, and comments posted on the digital wall (Padlet/Jamboard). There are several categories of the online environment on which the educational process depends.

2.11 Type of Environment

Harrison, 2014 there are various type of learning environment in different categories. In the first category, there are four types of learning settings. First is face to face learning environment in which both teachers and students traditionally, directly interact with each other on campus without any barriers. Its more teacher's centre but students have direct access to different academic resources. The second one is an online learning environment in which both instructor and learner use the internet for sole interaction. It has flexibility and more student centre. The next step is blended or hybrid learning environment where both combine online and face-to-face learning takes place.

Students attend course regular classes in school and then complete home tasks/work online. The last one is Web facilitated learning environment where virtual face-to-face courses are created or take place online by using technology. Syllabus lessons can be synchronous or asynchronous. It promotes individualized learning.

Gonzales, (2021) mentioned other four distinct types of learning environments one is learner-centered, based upon culturally sensitive, collaborative, personalized, prior experience respect, number two knowledge-centered related to new information, deeper understanding, sense-making and problem-solving, number three is community-centered environment belongs to norms, promote critical inquiry and cooperation, number four is assessment centered environment means teachers use all types of formative and summative evaluation methods to make students mastery in all learning outcomes. But in this research study scholar analyse three other types of assessment environments; virtual, intellectual, and emotional. How do all these atmospheric factors influence students' assessment process during online studies?

2.11.1 Virtual Environment

Puzhevich, (2020) It is an online digital platform for conducting the educational process by using the internet, a technological place where learners and teachers feel at comfort in enhancing and adding value to their learning/teaching. Good Virtual Learning Environment (VLE) lets users co-construct their learning settings together over time, usages sites with stand-alone assessment skills, organize, shares, and processes information quickly enriches the social collaboration between pupils and educators through discussion threads, polls, and surveys. This provides an infinite number of digital resources in the form of documents, worksheets, PowerPoint, videos, articles, and

podcasts. Parents also benefit from virtual education environment because they get informed or easily updated about their children's results.

Mikropoulos & Natsis, (2011) it is a net-based informative delivery structure that provides a more engaging, dynamic and manageable education environment. Courses may be both synchronous and asynchronous. First where participants are interact in real-time, and on the other hand in which students may respond to tasks online and do the work at their leisureliness. Existing eLearning software programs' benefits include: instructors receive real-time quick data on student's success; Remove the communication gap between peers and teachers, each pupil constructs their own coursework schedules according to their learning style, work can be completed from anywhere anytime. But with these advantages, the online learning and assessment environment still needs improvements, for that purpose future Course Management Systems (CMS) comprise more mobile applications that turn modules and lessons into games, magnify video conferencing functions, introduce advanced micro learning and digital libraries, encourage opportunities for social networking and facilitate digital certification tracking for learning new cybernetic skills.

There are different new ways to do formative assessment in virtual classroom environment likewise online polls, chat boxes, discussion boards, hand signals, for instance, thumbs up and thumbs down that assist teachers in understanding if learners grasp concepts or not. Other evaluation strategies are students can think pair share their ideas, exit tickets in which students write down their understanding of lecture as summary or conclusion remarks, use digital sites and apps like Nearpod (e.g. short quizzes, polls, surveys, and games), Flipgrid (short video discussion), Padlet (use for online posting images, texts, documents, links, voice and videos recordings), and Seesaw (drawing pictures, record videos, and portfolio formation). Dipsticks method is used to check

learners' previous knowledge by posing general or specific questions at the start of online class, teachers practice rating scale 1-5 to check if pupils get insight regarding the current lecturer or not. Another strategy is for learners to create a digital journal or one reflective pager (on Canva, Google slides, Journal Jot) to discuss their concerns and write down the main points of that day's lesson if learners are introverted and cannot raise their voice in an online session. Throughout the tutorial, the session asks students to précis all in the chat box, Padlet, Tweet, and Instagram post. Take assessment in the form of artwork like drawing sketches of historic events, concepts mind maps, writing poems or songs, act play record it with mobile apps (Voice Memos) then share virtually. Conduct peer-to-peer evaluation in zoom thru breakout rooms or via video conferencing Fleming, (2020). Researcher moves next on to the intellectual environment details.

2.11.2 Intellectual Environment

Lacroix, 2018 mentions that a good intellectual environment is the culmination of place where students can flourish; develop their personalities as well as their intellect. Students understand that they are comfortable developing their foundational skills (order, coordination, concentration, and independence) within this setting. Institute must focus on dimensions of intellectual development, starting by nurturing child language and vocabulary via communication, organizing learning activities, exposing children to a variety of social and academic experiences, and creating opportunities for thinking skills, problem-solving, memory, and creativity. For that making available affordances materials like books, pens, pencils, crayons, paper, and computers also facilitate them quiet place to study, read and write (Depending on the age, specific skills, and interests of each individual). Educational games are also a path to stimulate learning and mental growth in children. Rafi, 2015 there are some factors that affect the psychological well-being of students just as their readiness/preparedness for learning, motivation (both intrinsic and

extrinsic), intelligence, interest, mental health, individual differences, mastery and performance orientation, natural ability to learn. Instructional factors also influence learner cognition namely teacher personality, assessment standards, a strategy of learning, advising and counselling, learning methodology, curriculum, and teaching substances.

Institutions must consider human cognition working structure while planning online assessments in precise settings and allow each learner to progress on the basis of their own intellectual process. Actual learning and evaluation methods take place when educators are able to build information by creating connections between pictorial representative elements and like-minded verbal components. In the course of knowledge construction by using two processes novices handle new information firstly via pictographic technique and second through oral mode. Whenever students prepare or understand anything they create a schema by selecting and arranging relevant new information and then assimilate it with previous knowledge utilizing their cognitive engagement. If complicated task assigns to students without any proper acknowledgment of their cognitive system cause mental challenge for them. (Mayer, 2014a)

Turner & Harder, (2018) identify the following behaviour that benefits students in both face-to-face and online psychological learning and assessment environment for instance allowing them to make mistakes without any consequences, quality facilitator service delivered that boost confidence in students, activities oriented tasks, initially arrange orientation session in which all information and guidance provided related to online evaluation methods, before stimulation clarify objectives and pre-learning activities to the learner, evaluators pre-brief about assignments/tasks furthermore notify how much time allotted to complete them, remind pupils regarding their abilities that aid them in decreasing anxiety and they deal with stressful situations in the time/moment of online exam. Continuously conduct formative assessment to make sure of their

preparation level. The online intellectual environment stimulates problem-solving and skill acquisition culture under control and flexible setting. The third environmental factor is emotional.

2.11.3 Emotional Environment

The emotional environment is the degree of observable and invisible feelings. It has two dimensions positive one in which parents, staff, and learners feel good, safe, satisfied, and happy, support pupils' emotional wellbeing, show empathy, a child able to manage plus express his /her feeling, warmly accept their nature and according to the individual need of students provide steadiness to them. On the other hand, one where students, parents, and staff feel insecure, sad, and disturb due to external and internal dynamics of the institution results in affecting their mental health and well-rounded growth considered a negative aspect of online social-emotional setting written by Simon, (2016).

Winnicott, (2018) stated that a good emotional environment during an online assessment is very essential because learners use their full potential to complete their tasks/assignments and achieve academic, social, and career-oriented goals. They holistically flourished in all phases of life and develop a positive mind-set toward online exams. If educators and institution staff express supportive behaviour then students work and complete evaluation projects in both circumstances in groups corporately as well as individually. Contrastingly in bad emotive setting, students struggle in communicating with others and building friendly relationship with their classmates. Damage their physical and mental health which also poorly impacts their academic accomplishment, they don’t touch their full capacity. Throughout the online exam duration, instructors should apply the following ways to make the environment of online evaluation

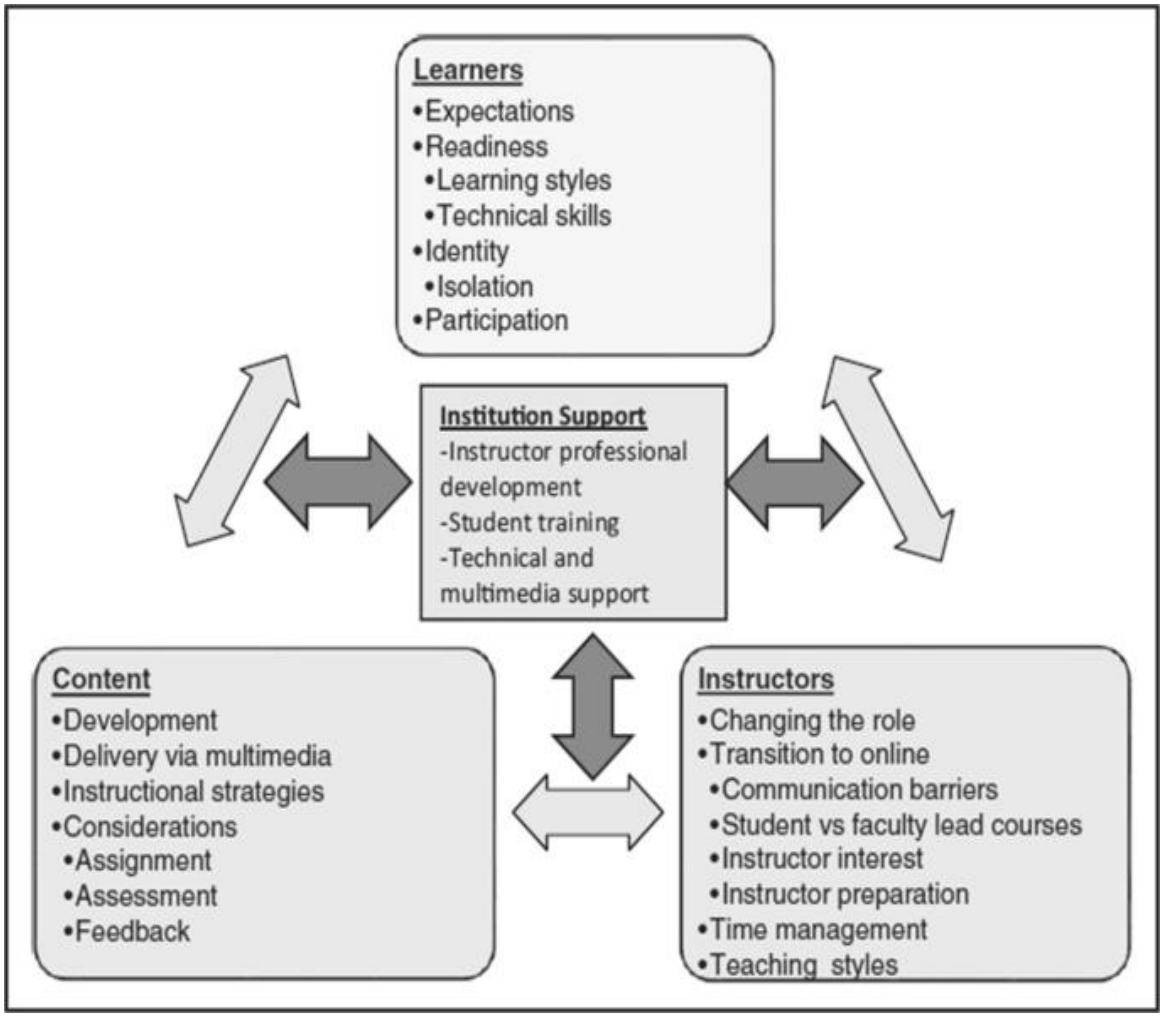
emotionally helpful just like forming optimistic relationships with students, stimulating a sense of ownership and feeling them valued during an online session, accepting diversity and their unique behaviour, giving them freedom of choice while doing remote assessment, arrange flexible routine or timetable of online assignments submission that does not disturb learner everyday work, supportive feeling given by the staff when virtual assessment takes place and celebrate pupils good grades or achievements.

Andrade & Brookhart, (2020) refer to self-regulation that is a process in which children control their emotions, actions, behaviour while dealing with particular circumstances. In other words, it's a technique to calm down schoolchildren. In contrast of that co-regulation is defined as a procedure in which teacher is aware of when a learner needs guidance and when they do their work without any outside interference. Educator understands clues given by the child in consistent manner (like facial expressions, confusedness, etc.) during online exams before approaching for assistance. Staff designs well coming remote assessment surrounding that encourage mutual respect, tolerance, be predictable and prepared when dealing with uncertain scenarios, and do more apprentice centre activities. Subsequently defining all terms that are part of the thesis topic, the researcher then includes models which support the research study framework.

2.12 Four Models That Support Research Study Framework

Figure 2.1

Model of Online-Education and Online-Assessment Environment



Note: Three major components in an Online-Education and Online-Assessment environment given by (Kebritchi et al., 2017)

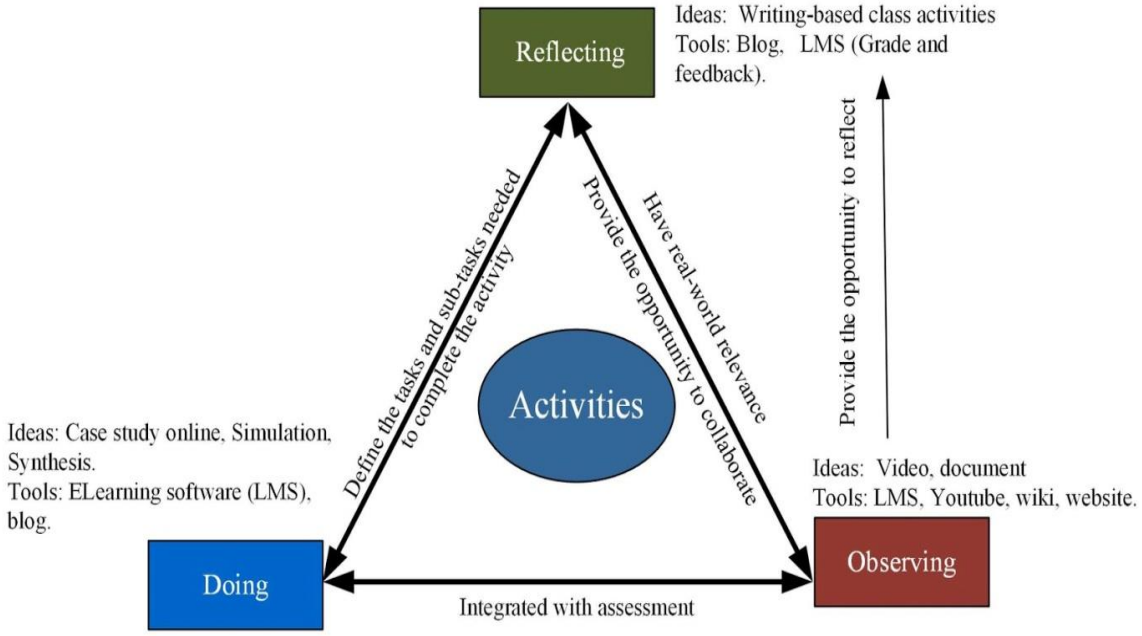
Figure 2.1 shows the model presented by (Kebritchi et al., 2017) about the three most important components that is part of the online assessment and education environment which is instructor, learner, and content. In each category, there are sub-sorts. All three elements are connected with each other. The scholar in the content category mentions its development process while focusing on the online assessment environment, How to deliver the content via multimedia, which instructional strategies

work best to make online assessment effective, considering the different types of online assessments including assignments, providing quick and quality feedback to students. In the next category the educational scholar mentions about changing roles of the instructor because of transferring into online assessment mode, they need to deal with communication barriers, by arranging student and faculty lead courses that build their interest and prepared them with blended and effective teaching styles which help in the smooth performance of online assessment. Instructors carry out all their tasks under proper time management strategies.

In the third category which is learner, the scholar highlighted the following points that are students' expectations from online assessment, their readiness in terms of learning style, and technical skill proficiency while performing and submitting an online assessment. Students show their presents through participating in the formative online assessments that help in standing out their identity in front of instructors. Scholar figures out that all three elements of the online assessment environment are connected with each other and run well by institutional support. Their role is to focus on the professional development of instructors and the technical training of students. Help in preparing and accepting both sides' parties on changing mode of exams by proving multimedia and advanced learning support.

Figure 2.2

Active Model for Online Assessment



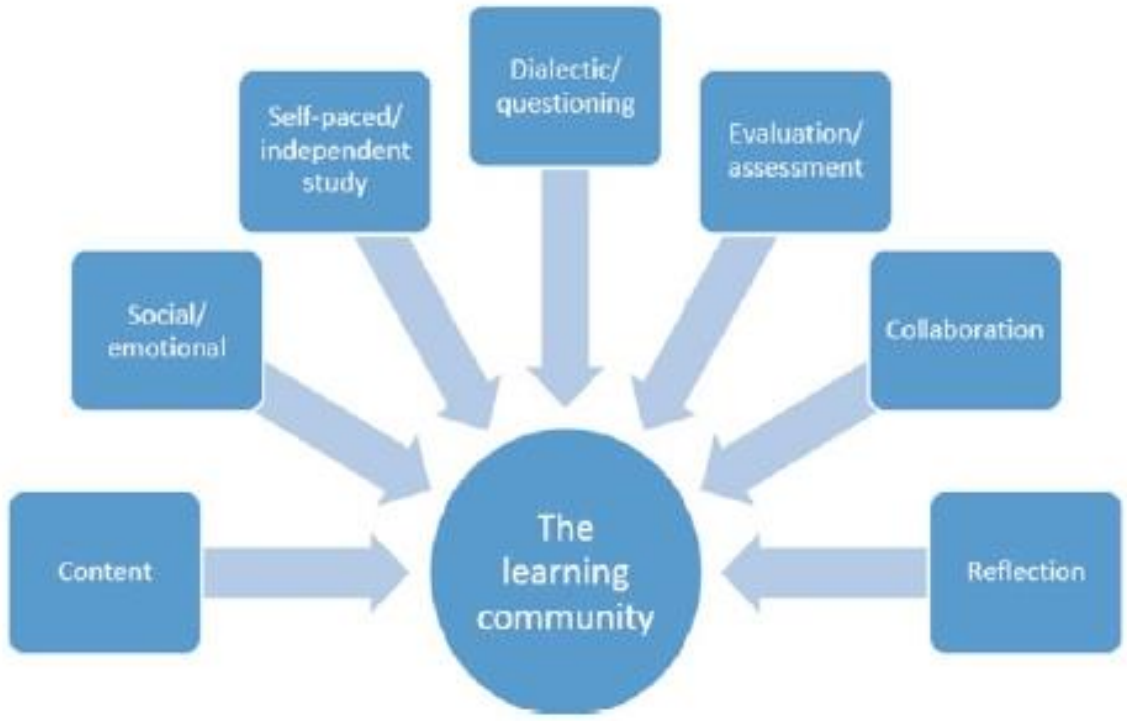
Note: Active model for online assessment activities by (Lac Hong University, 2020)

A practical case study done at Lac Hong University, 2020 in which they recommended an active online model for conducting online teaching and assessment activities as shown in above Figure 2.2. According to their active model of online activity, teachers need to teach and assess learners through real-world problems, to complete evaluation activities teachers first clearly define tasks and subtasks in online mode, and create situations for student collaboration, peer assessment, and cooperation, after that in virtual environments provide feedback opportunities to help students when they respond to problems. However, to perform the assessment tasks, the teacher must create an activity for the learner through or by using multiple online resources like YouTube videos, animated clips, pictures, documents, various blogs, and websites. Practical activities in blended and classroom training mode are completely different from practical activities in distance learning mode. To carry out such evaluation tasks, teachers

should create research themes based on the following online topics as Simulation and synthesis of given materials, online case studies, activities related to learning by doing, and higher order thinking skills, that allow teachers to write feedback and provide grades on the students hands-on activities. Therefore whole this model process is based on observing, doing, and reflecting triangle with both direction/side arrows that shows this model design effectiveness for online assessment. Entire this procedure is carried out through eLearning software which is a learning management system (LMS).

Figure 2.3

Multimodal Model for Online Education



Note: Multimodal model for online education presented by Picciano's, 2017

Picciano, (2017) developed multimodal model for online education that helps the online learning community. This model is used or cited in almost 400 educational research papers until now. Earlier the concept of learning community and its elements has

been given by Garrison et al., (2001) after that which is now modified by Picciano, (2017). First of all, in model mentions content this is the primary element of the teaching and assessment process both in face-to-face and online environments. Under traditional educational setting usually teachers speak students listen, Mayer (2014) learning is boosted through visualization. In all subjects such as arts, science, history, computer, literature students' knowledge would be improved by using digital images. In an online environment, by using different Course/Learning Management System software for example Moodle, Canvas, Schoology, and Blackboard, institutions make delivery of instructional procedures smooth in online mode as well. For assessment, purposes use a variation of media texts, audios, videos, and games that make evaluation methods effective.

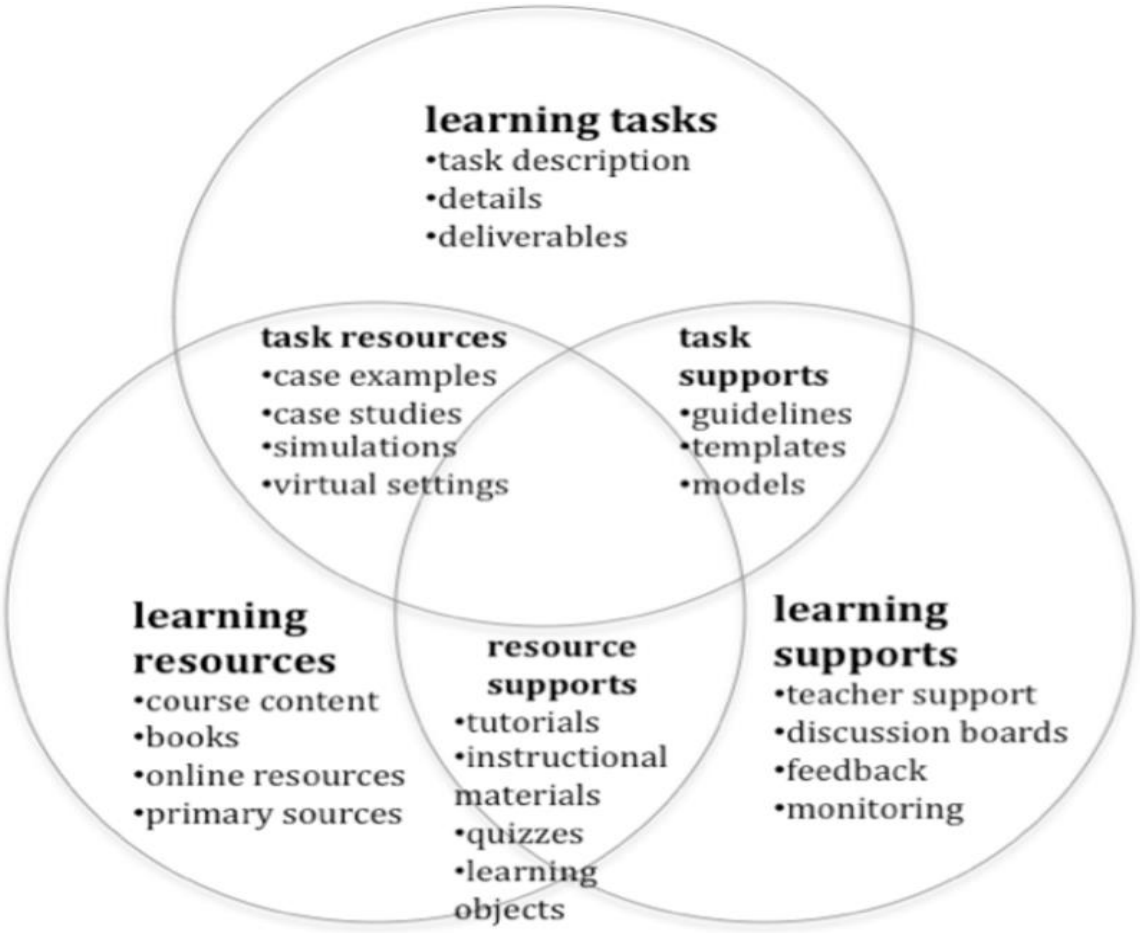
Educational institutions are not only responsible for teaching content and skills but also provide social and emotional support to students when needed. The physical presents of teachers and staff are comforting for learners of all grades even at the university level. Therefore in online mode also make sure faculty members availability for giving emotional and social support. During the assessment period in online way, teachers are accessible to students for answering any queries related to exams. Scholars in stage three give priority to self-paced /independent learning. Every student knows how much they have information about anything. In which subject they need more concentration or need to put more effort hence self-evolution is an important part of online education. The researcher through this model expresses that questioning/ dialectics or the Socratic Method is effective to know students' previous knowledge, starting a discussion or new topic lecture, or evaluating students' academic performance. Thus in the online system, instructors use Threaded Electronic Discussion Board for example

Voice Thread and Backchannel Chat as an effective formative online assessment approach.

Evaluation is the most important part of this model that why the researcher mentions this as a separate element and also discuss this in other components. Learning management systems (LMS) or other platforms/tools provide hugely and several mechanisms for fulfilling this requirement like electronic papers, tests/quizzes, assignments, portfolios, essays, projects, and submissions in the form of images, video, and audio clips. Class discussion and oral presentation through podcasts and YouTube videos are also helpful for online assessment; all of these provide a permanent accessible record of student's progression to both instructor and learner. Collaborative learning in the form of group works, peer assessment, and social work to complete problem-solving projects and promote cooperation among students is a part of face-to-face learning for decades. But currently, with the help of mobile, emails, technology, and social media we can work with anyone within minutes everywhere in the world. Wikis are especially considered a great source for developing content and knowledge, and correspondingly for creating evaluation and peer-review between learners (Fredericksen, 2015) at last scholar in a model label that the reflection or feedback of instructors plays a productive role in online education and assessment process in the form of blogs and comments.

Figure 2.4

Authentic E-Learning & E-Assessment Framework Design



Note: Framework that indicates Elements of Authentic E-Learning and E-Assessment Environment Settings adopted from Herrington, et al. (2009)

This e-learning framework also supports the themes of the researcher adapted framework of a supportive online assessment environment that was used in the development of the questionnaire (research tools) of this study. The author of this framework Herrington, et al. (2009) focuses on three elements that help in building an authentic online learning environment. All these components are overlapped with each other. The first element is learning tasks during online education as online tasks should be carefully planned including problem-solving projects, presentations, and research assignments that promote cognitive thinking and inquiry nature in students. These all

tasks should be under a flexible time limit and space thus students do not feel any work pressure. The second element is learning resources which included text, articles, word documents, PowerPoint slides, accessibility to different websites for students, on-time material provided for online assessment, etc. not only learning resources but also technological setup (laptop, speaker, network) to both learner and instructor.

The last element of the e-learning framework is learning support for students during online education. Support in all its forms such as support from department or institution faculty by providing access to the quality learning management systems and wikis. Show social presence, helpful communication, and collaboration. As a teacher encourages group work assessment, provides clear instructions, and mails mock/practice assessment templates to learners hence they are prepared for the actual one. The author of this framework stated that teachers also give emotional support to students and appreciate their work with positive timely feedback. Teachers must have the full knowledge of how to conduct a critical and synthesizing level online assessment. The researcher is also to thinks that all three elements of this model need to work together for the successful handling of online learning and assessment culture which is a compulsory necessity in today's world. The upcoming topic is about the procedure and condition of evaluation in Pakistan.

2.13 Assessment in Pakistan

Khattak, (2012) stated that there are five levels of education in Pakistan primary level (1-5), elementary level (6-8), secondary level (9-10), higher secondary level (11-12) and university level (13-onwards). Exam papers are based on 20% objective, 50% short answers, and 30% subjective answers. Two types of examination systems in Pakistan are internal and external; the first one is conducted inside school faculties (marks by teachers)

whereas external examination is arranged by outside school faculties (boards provide marks) which are also called public examination boards. It helps out in finding students' achievement, provides the opportunity for a fair comparison between schools or students of different institutes, guides the teaching-learning process in schools, and also promotes testing-oriented pedagogies (Peterson, 2007). From grades 1 to 4, 6, and 7, all use both formative and summative assessments done by a school teacher in the form of December/annual exams (internal examination) whereas grades 5, and 8 assessments are done by an external examination board. Government builds examination commissions from the primary to elementary level. The new organizational structure has been established by Sindh, Punjab, and Baluchistan for the handling of terminal examinations of public and private sector schools for grades 5 and 8. These are called the Punjab examination commission (PEC) which start functioning in 2005. Sindh examination commission (SEC) formulated a standardized achievement test (SAT) for classes 5 and 8. Baluchistan examination and assessment commission (BEAC). Khyber Pakhtunkhwa also works toward the formation of a centralized examination commission, and in 2017 will conduct its first central assessment. Khattak, (2012).

The secondary and higher secondary level external exams in Pakistan are directed by three sectors. (1) exams planned by the provincial ministry of education represented by the divisional Board of Intermediate and Secondary Education (DBISE),(2) tests regulated by one federal ministry of education in the capital city denoted as the Federal Board of Intermediate and Secondary Education (FBISE), (3) assessment managed by two private organizations for instance Cambridge/Oxford Examination system and Agha Khan University Examination Board (AKU-EB) designated as Private Board of Intermediate and Secondary Education (PBISE). Schools are allied with different BISEs hence students have selection choices on examination boards. Public schools are affiliated

by a divisional board whereas semi-government and private schools are associated with any or all BISEs. However, in Pakistan, the quality and impact of these exam boards on students learning have big question mark Rind et al. (2019). In Pakistan at the universities level three ways of examination measurement take place; 1) continuous internal assessment (CIA), 2) semester system, and 3) question bank. The University grant commission recommends an examination system that serves as an alternative to the external examination and continuously evaluates the skills/performance of students throughout prescribe course. Reduce dependency on exterior factors for constant observation of pupils' learning. Semester system in which the academic year is divided into two terms or parts, Semester word exactly means a period of six months, in Pakistan four year bachelor's degrees comprise eight semesters and a two-year master's degree contains four semesters. In universities question bank involves a large number of objective questions with answers, stored for repetitive use in assessment; it is cover the entire course content of all fields to fulfil definite predetermined purposes Khattak, (2012).

(Rehmani, 2012; Ali et al. 2016) criticize the education and examination system in Pakistan highlighted that current faults in education policies due to corruption, lack of transparency and quality education, spend less than 2% of GDP on education, bribery system at peak, testing practices by BISEs do not support the process of teaching-learning, private schools put more focus on extra-curricular activities and disregard tutees academic performance, for exams preparation put a lot of pressure on students to memorize content/concepts, in papers test items repeated frequently, the curriculum does not cover, no focus on academic competencies and assessment of skills, exams inhibits creativity and base upon short term memory because questions asked in exams cannot check intelligence or reasoning skills but just capability to reproduce memorize content

that also question the validity, credibility and reliability of the examination. The mood of the examiner is sometimes affected by the atmosphere which brings results in an inaccurate, subjective evaluation process. At the board level for getting more money, evaluators check a maximum number of papers in one day which affects the quality of the assessment. Exam calendar dates are (May, June, and July) which are also unsatisfactory, for the reason that at that time there is extreme summer, and students cannot sit for three hours in the exam hall. Moreover, a study directed by UNESCO (2007) also censured the assessment system of Pakistan because it failed to evaluate basic skills, due to poor education, management, and supervision. Always assessment is summative, subjective, and irregular with no feedback. On large scale malpractices happened during exam centres such as question paper leakage, unauthorized material smuggling, ghost centres, switching papers between candidates, etc. at the end of this literature review researcher summarized whole topics from beginning to end, and also wrote down the study gap and purpose of this research study.

2.14 Relevant Researches

Kakepoto and Jalbani (2021) have stated that online assessment is still in its early stages of development and implementation in educational institutions across the South East Asia region, including Pakistan. The primary and essential needs of every educational institution are to teach students efficiently and effectively and ensure timely completion of the academic syllabus, which faces major challenges due to uncertain circumstances around the world. This research was conducted to determine the difficulties faced by administration and students in the implementation of online teaching and learning. Data was collected in the form of survey questionnaires from students of computer science, information technology, statistics, mathematics, and language departments. The researchers discussed several issues, including economics, poor

computer literacy, electricity load shedding, slow internet speed, lack of communication, lack of technological proficiency, academic inconsistency, poor morals, and social aspects. All of these factors significantly affect the successful execution of formative online assessment and create e-learning teaching barriers. Additionally, in its recommendations, the study assists academic administrations in developing effective policies for online education mechanisms in Pakistan. However, in this study, the researcher identified a gap in data collection, specifically the absence of data from teachers and Social Sciences Faculty students. Furthermore, the study did not discuss the environmental factors in detail during online assessment.

To determine the efficaciousness of online tests, we need to implement them with other practical assessment types to make the context of the overall academic learning experience beneficial for students. The study conducted by Ogange et al., (2018) used a survey to get information about students' perceptions related to online assessment. The findings show that peer assessment and computer-marked assessment provide more flexibility and immediate feedback than educator-marked assessment mechanisms. This paper investigated the learners' experiences with the different types of assessment. In their conclusion, researchers support the practice of formative assessment during e-learning, which positively influences students' engagement and learning outcomes. Nonetheless, in this study, teacher perceptions are not mentioned, and there is no comparison of public and private university online assessment experiences.

Snekalatha et al., (2021) assessed the medical students' perceptions of the reliability, usefulness, and practical challenges of online tests. A questionnaire with items regarding the practical challenges, reliability, and usefulness of the online tests in general and about different types of online assessment methods in particular was sent to the students online. A large percentage of students used mobile phones to undertake online

tests, and network connectivity issues were considered to be a serious concern. Viva voce by video conferencing was thought to be most reliable, and multiple-choice question-based assessment was found to be more practically feasible. The results suggest that medical students find online formative assessments helpful for their learning, despite their concerns about reliability and practical challenges, although this study only involves medical students and not the Faculty of Social Sciences.

The aim of this case study was to examine the online formative assessment (FA) and feedback practices of three English as Second Language (ESL) teachers from universities in India, Bangladesh, and Nepal. The results revealed that all three teachers actively engaged their students in FA practices and performed them regularly and in a student-friendly manner. However, they did not utilize the obtained information effectively, and several areas needed improvement. The researchers recommend conducting large-scale studies to validate if these findings hold for other university ESL teachers or not (Mahapatra, 2021). The study is significant. However, the study population and sample size are too small to draw generalizable conclusions.

Peytcheva-Forsyth, (2017) noted several advantages of online assessment. Firstly, it is cost-effective compared to traditional exams. Secondly, it provides students with immediate feedback. Thirdly, the marking and evaluation process is fully automated. Fourthly, online assessment can take place at anytime and anywhere. Fifthly, it offers a variety of tools for assessment. Lastly, all types of evaluations, including formative, summative, placement, and diagnostic, can be conducted online. Online assessment also offers lifelong learning opportunities to those in geographically restricted areas and disabled students who cannot attend educational institutions. Additionally, it is replicable and has suitable data management sources.

On the other hand, there are also some challenges with online assessment; for instance, it mostly tests the objective base knowledge of students and is hampered by technology illiteracy on both the teachers' and students' behalf. Some underdeveloped countries have no proper technological advancement. The most important disadvantage is cheating through online content and high levels of copy-and-paste plagiarism in online assessments. This paper elaborately highlighted every aspect of online assessment, but it is not academic research in the Pakistani context. Therefore, in Pakistan higher educational institutions, it is necessary to analyse the environment of formative online assessment, find out the experiences of teachers and students about online assessment, and compare both sectors' universities' online learning performance. For that reason, this research has been conducted by a researcher.

2.15 Summary

Researcher learned that the assessment practices not only followed in today world but its applications have started from very old days, while reviewing literature. Current in 21th century the term formative online assessment is much usable, where learning for assessment takes place by utilizing information communication technology platform. Researcher think the authentic and effective online assessment is the one which help out in enhancing students learning, resolved study problems by focusing on their learning background, learning style and also fulfil academic goals during teaching-learning process. Three dimensions which are virtual, intellectual and emotional plays key role in successfully handling of online assessment. Virtual environment is related to availability of online platform (LMS or any other), network, online resources, technological setup etc. intellectual environment deals with building learners cognitions skills and emotional setting where full positive and effective emotive support provided to candidates.

Scholar believes that the existing assessment system of Pakistan has various malpractices at all grade levels in testing centres. There is high level of misconducts in physical examination of Pakistan like cheating, paper leaks and corruption. Moreover, there is no one who tries to improve the mismanagement of the system. When uncertain emergency conditions started, the assessment system shifted to an online platform for all academic levels all over the world even in Pakistan until the pandemic situation comes to an end. At that time formative online assessment has been in full use or trend for almost two year period. Therefore researcher think in Pakistan's higher educational institutions, it is necessary to analyse the environment of formative online assessment and also to find out the experience of teachers and students about online assessment at higher education level furthermore aware ourselves and the administration in the future on which areas we will need to do work if such circumstance will happen again. For that purpose, this study has been carried out by the researcher. In the upcoming chapter third comprehensive research methodology is described by the scholar.

CHAPTER 3

RESEARCH METHODOLOGY

In this third chapter researcher considered that the most important part of any research has to set appropriate research methodology, where the following components by scholars required to discussed to build clear or productive pathway for organizing further research study process. For instance, study about the nature or type of research design that forms overall structure which consists of the paradigm (worldview) of their research, research approach, methodological choices, strategies, the time horizon of study, techniques and procedure for data collection and data analysis. Some other elements also need to be included such as the population of research study, sampling techniques and sample size determination, instruments used during study, validity, and reliability of research tools, and last ethical consideration.

This research philosophical paradigm was pragmatism because that support or applied both qualitative and quantitative approaches in study and also has based upon real-world practice-orientation. The time horizon of current study was Cross-sectional (collected data at one point in time). The first aim of this study was to analyze the environment of online formative assessment. Second, explored the experience of university students and teachers during online formative assessment at higher education level and lastly compared the demographic variables. The remaining elements of research methodology were comprehensively explained below separately.

3.1 Research Design and Approach

Research design is a framework or overall plan for conducting research. It is the strategy that outlines the methods and procedures for collecting and analysing data and is

used to ensure that the results of the research are valid and reliable. It is a blueprint for conducting a study that includes the research methods, the research question, the development of research instruments, participants, and sampling techniques, the methods of data collection, the data analysis plan, and the expected outcomes. It is more detailed and used to guide the implementation Creswell & Creswell (2017).

Research approach is "the strategy or plan of action adopted by the researcher to answer the research questions and/or test the research hypotheses". It involves the selection of methods such as qualitative or quantitative and specific techniques for collecting and analysing data, as well as the interpretation of the results. The research approach should be tailored to the specific research problem and be based on the available resources and the research objectives. The research approach should also consider the ethical implications of the research (Kumar, 2018).

The concurrent Triangulation Mixed Method design had been used to make results more appropriate and authentic. Both qualitative data and quantitative data were collected at the same time but separately. Also, data analysis process was done separately. Then in the end results of both data had compared.

The researcher used multi-disciplinary triangulations, which included two types of triangulations in this study (first data triangulation and second method triangulation). In data triangulation teachers and students, both had been used as sources persons of data collection also in method triangulation both qualitative and quantitative approaches had been used in the form of interview protocol and questionnaires to accomplish objectives one, two, and three.

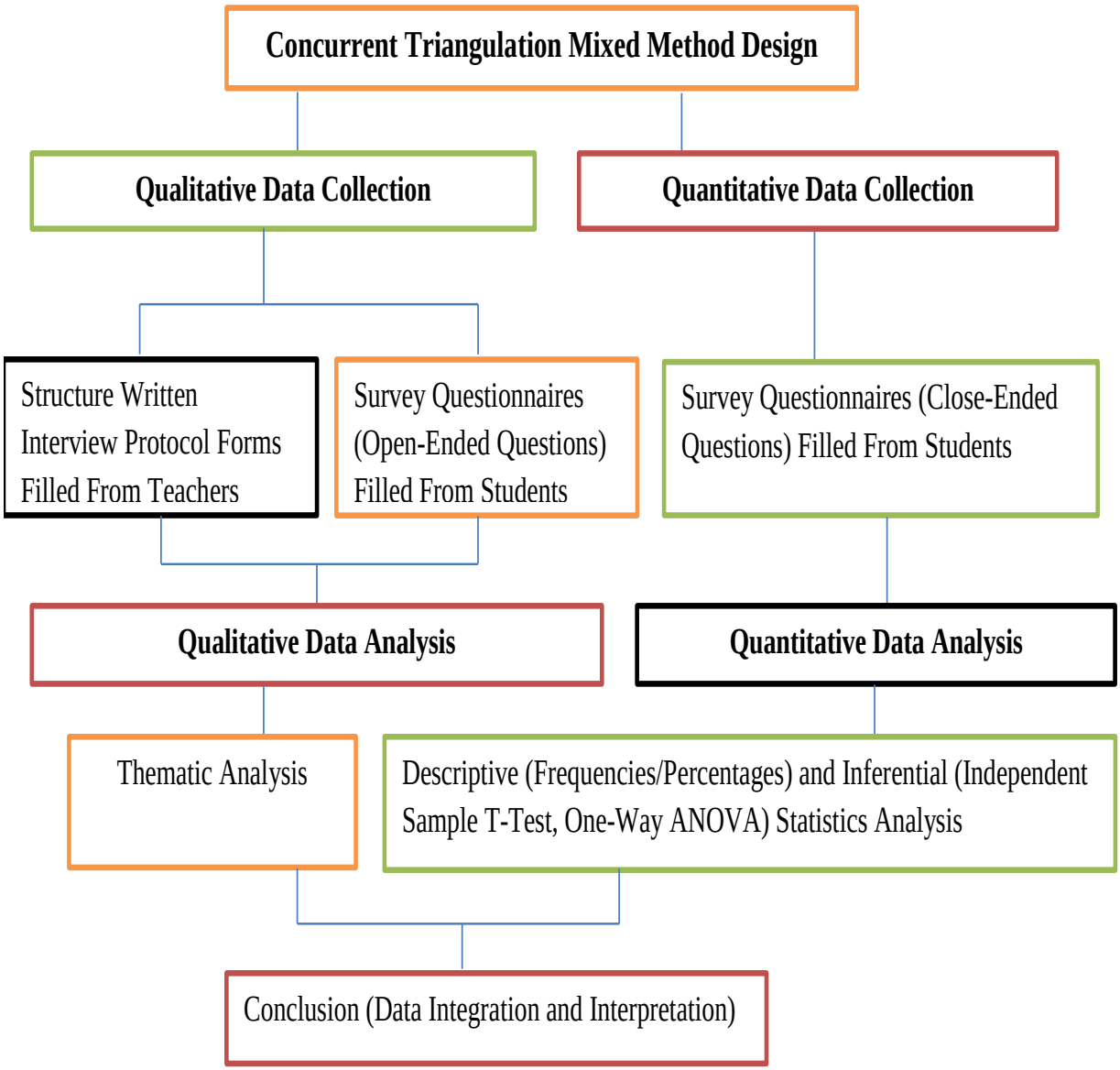
First and fourth objectives was achieved by using survey questionnaires with close-ended questions (quantitative approach), then filled them from students which contained questions related to virtual, intellectual, and emotional environment of online

formative assessment. The scholar applied descriptive and inferential statistics, subsequently related the findings/results with research questions/null hypotheses, in the end, analyzed and compared the environment of formative online assessment at higher education level.

Second objective was accomplished by using questionnaires open-ended questions (qualitative approach), next completed survey from students in which consisted of three questions about undergraduates experienced during online formative assessment. Third objective was attained with seven questions of interview protocol forms (qualitative approach) filled by teachers, to know about their experienced during online formative assessment. Both data were analyzed through thematic analysis. In conclusion, general findings were compared and contrasted by using supportive online assessment environment framework. Below in detail figure 3.1 shows diagram of the mixed method design.

Figure 3.1

Concurrent Triangulation Mixed Method Design



Note: Concurrent triangulation mixed method design (adapted from Creswell et al., 2003, p. 181).

Table 3.1 precisely described the mixed method research design and its decided component for current study. This table was designed keeping in view the described components of mixed–method research by Creswell & Clark, (2011).

Table 3.1

Components of Mixed-Method Research Design

Components of Mixed-Method Research Design	
Determine Level of Interaction	Independent Level of Interaction. (Independent Strands of Qualitative and Quantitative Data)
Determine Priority (Weight) of Qualitative and Quantitative Strand	Given Equal Priority to Both Qualitative and Quantitative Data.
Determine Timing (Order)	Concurrent Timing.
Determine Where and How to Mix (Combining and Integrating)	Mixing at Level of Compare or Relate /Interpretation. Strategy: Concurrent Triangulation Design.
Mixed-Method Research Design	Concurrent Triangulation Mixed Method Design.

The researcher used the above table of mixed method research design to develop more understanding of the research problem by obtaining different but complementary data for validation purposes. The above table explains the collecting and analyzing of two independent strands of qualitative and quantitative data at the same time or in a single phase. Give prioritization to both methods (survey questionnaires and interview protocol) equally. Keep the data analysis independent. Mix the results during the overall interpretation at conclusion stage.

3.2 Population of Research Study

According to Kumar (2018) a research population is a group of individuals or objects that are studied in a research project. It is the target group of a study, and the results of the research are usually generalized to this population. The target population is

the specific, conceptually bounded group of potential participants to whom the researcher may have access that represents the nature of the population of interest. The research population can be defined in terms of characteristics or demographics such as age, gender, ethnicity, or geographical location. Additionally, the size of the research population can vary depending on the scope of the study, and the population can be either finite or infinite.

The reference for the sources, including the names of the universities and their official website links, from where the population data was obtained, are attached in Appendix B. The population of this research study was Bachelor level university students and teachers of Islamabad Capital Territory. The researcher focused on only six universities offering common programs/departments under the Faculty of Social Sciences. From those six (6) universities researcher selected three public sector universities and three private sector universities for data collection and analyzed the environment of formative online assessment at Higher Education Level. In next stage of stratified random sampling technique, Researcher selected those four Bachelor Departments that were mostly found in both public and private sector universities. Which were Psychology department, International Relations department, Mass Communication department, and Economics department for data collection from both students and teachers. In table form, the name of six (6) selected universities mention in the appendix section of this thesis. In table 3.2 researcher mention the number (population) of teachers available in every six universities with their specific teaching departments at Bachelor level and below in table 3.3 researcher mention the number (population) of students available in every six universities with their specific studying departments at Bachelor level.

Table 3.2

Population of Teachers

Sr. No	Universities	Bachelor of Science in Psychology	Bachelor of Science in International Relation	Bachelor of Science in Mass Communication	Bachelor of Science in Economics	Grand Total
1		5	4	8	8	25
2	**Public**	8	13	16	11	48
3	**Sector**	12	12	---	10	34
4		7	8	9	---	24
5	**Private**	5	5	6	6	22
6	**Sector**	6	5	---	5	16
	Grand Total	43	47	39	40	**169**
Total Population of Teachers = 169						

Table 3.3

Population of Students

Sr. No	Universities	Bachelor of Science in Psychology	Bachelor of Science in International Relation	Bachelor of Science in Mass Communication	Bachelor of Science in Economics	Grand Total
1	**Public**	230	200	350	360	1140
2	**Sector**	240	365	450	310	1365
3		282	308	---	489	1079
4	**Private**	210	240	270	---	720
5	**Sector**	150	140	168	175	633
6		145	120	---	160	425
	Grand Total	1257	1373	1238	1494	**5362**
Total Population of Students = 5362						

3.3 Sampling Technique of Research Study

3.3.1 Teachers

For the selection of population of teachers stratified random sampling technique was used. The reason for selecting this technique was to reduce sampling error by collecting equal sample size from both strata with greater variability for comparison, to avoid underrepresentation, the total sample size evenly divided between subgroups, and to ensure adequate number for comparing even from the smallest groups in a population (Frost, 2019). Strata developed on the basis of sectors (public and private universities). Furthermore, the convenient sampling technique was used to target the sample size and filled structure written interview protocol forms/questions from teachers who teach at Bachelor level in selective universities mentioned in population.

3.3.2 Students

For the selection of population of students stratified random sampling technique was used. Strata developed on the basis of sectors (public and private) universities. Afterward, simple random sampling technique was used to target the sample size and fill questionnaires from students who study at Bachelor's level in selective universities mentioned in population.

3.4 Sample Size Determination

3.4.1 Teachers

The sample size in qualitative data collection (interview protocol) must be large enough for the generation of thick descriptions. For generalizability in qualitative studies minimum of 15 to 17 individual interviews enough as stated by Guest et al., 2006. In all

research including both qualitative and quantitative studies 10% of the population considered enough for generality, therefore, 10% of the 169 teacher population was 17 individuals. After whole above literature evidence researcher deliberated the teachers' sample size for the interview needs to be 17.

3.4.2 Students

In this research study, the approximate population of students was 5362, Because of time and resources deficiency research rounded off the 5362 population into 5000. In this research study, for finding sample size researcher followed the Cohen, Manion, and Morrison (2018) table where there increase in population, then proportion of population in sample decrease. In their table, for 5000 population the appropriate sample size was 357 with 95% confidence level and 5% or .05 margin of error. To justify this sample size researcher give the example of one another known American researcher Yamane (1967), who generates formula $n = \frac{N}{1 + N(e)^2}$ to calculate sample size from known population. In this formula, N represents population and e represents margin of error which was equal to.05 or 5%. The person creates table by using this formula for each specific population. Therefore according to his table for 5000 population the appropriate sample size was 370. With respect to this entire evidence researcher assume student sample size of 370.

The researcher collected two open-ended survey questions of questionnaire (qualitative) data from 50 participants. The selected sample size was supported by giving reference of Dworkin (2012) the well-known scholar who suggests a sample size of 5 to 50 in the qualitative study while Morse (1994) recommends 30 to 50 as well. In below table 3.4 the researcher represents both population and sample size of university teachers and students with their respective data collection methods.

Table 3.4

Population and Sample Size of Research Study

Sr. No	Respondents	Population	Sample	Method
1	Teachers	179	17	Interview
2a	Students	5362	370	Questionnaire (close-ended survey questions)
2b	Students	5362	50	Questionnaire (open-ended survey questions)

3.4.3 Demographic Information

Table 3.5

Demographic Information of the Participants (Students)

Sr.no	Variables	Categories	Frequencies (N)	Percentages (%)
1	Universities	University 1	70	18.9%
		University 2	64	17.3%
		University 3	63	17.0%
		University 4	55	14.9%
		University 5	60	16.2%
		University 6	58	15.7%
		Total	370	100.0%
2	Sector	Public	193	52.2%
		Private	177	47.8%
		Total	370	100.0%
3	Gender	Male	168	45.4%
		Female	202	54.6%
		Total	370	100.0%
4	Residential Area	Urban	199	53.8%
		Suburban	55	14.9%
		Rural	116	31.4%
		Total	370	100.0%
5	Department	Psychology	126	34.1%

	International Relation	108	29.2%
	Mass Communication	72	19.5%
	Economics	64	17.3%
	Total	370	100.0%

As shown in table 3.5 demographic information of total participants (N = 370) given. There were a total of six universities, from which data was collected by researcher. 70 (18.9%) data gathered from university one, 64 (17.3%) data accrued from academy two, 63 (17.0%) data compiled from educational institution three, 55 (14.9%) info accumulated from university four, 60 (16.2%) statistics assembled from academia five, and 58 (15.7%) data amassed from university six. 193 (52.2%) respondents were selected from the public sector whereas 177 (47.8%) students were picked from private sector universities. 168 representing (45.4%) of the participants were male and 202 signifying (54.6%) were female. 199 which represents (53.8%) of the respondents were settled in urban areas while 55 denotes (14.9%) of the participants lived in the suburban regions, and 116 symbolize (31.4%) of the respondents belonged to rural areas. 126 (34.1%) undergraduates were from the department of Psychology. 108 (29.2%) students were studying in the department of International Relations. 72 (19.5%) learners were belongs to the department of Mass Communication and 64 (17.3%) undergraduates were from the department of Economics.

3.5 Instruments of the Research Study

In this study, the researcher used a mixed-method approach. Therefore both qualitative (interview) and quantitative methods (questionnaire) were used as data collection tools. Furthermore, both research instruments (interview protocol and questionnaire) were adapted.

3.5.1 Description of SOAEQ (Supportive Online Assessment Environment Questionnaire) for Students

The questionnaire had been adapted afterward doing some changes in most statements from a standardized questionnaire (Padayachee et al., 2018) based on the theoretical framework of (Thompson and Wheeler, 2010). Tool contained both closed and open-ended questions and followed four-point Likert scales (strongly disagree-1, disagree-2, agree-3, and strongly agree-4). The reason to use even number Likert scale without neutral option was to get specific/ unambiguous responses, achieved true essence and clear answers, which help out in building simple dichotomy report stated (Hopper, 2016). The tool consisted of 5 sections. The first section was composed of total five items related to demographic information (university name, gender, sector, residential area, and department) of students with their items coding DI-1, DI-2, DI-3, DI-4, and DI-5. The second section contained total of fourteen statements related to virtual environment of online assessment with their items coding VE1, VE2, VE3, VE4, VE5, VE6, VE7, VE8, VE9, VE10, VE11, VE12, VE13, and VE14. The third section contained total eighteen statements related to intellectual environment of online assessment with their items coding IE1,IE2,IE3,IE4,IE5,IE6,IE7,IE8, IE9,IE10, IE11,IE12,IE13,IE14,IE15,IE16,IE17,IE18. The fourth section contained total thirteen statements related to emotional environment of online assessment with their items coding EE1, EE2, EE3, EE4, EE5, EE6, EE7, EE8, EE9, EE10, EE11, EE12, and EE13. The Last section contained three open-ended questions to know about benefits and challenges experienced by students regarding formative online assessment at higher education level with their items coding OEQ1, OEQ2, and OEQ3. The tool was used to get answers to qualitative and quantitative research questions and test null hypotheses. Below table 3.6 present tool descriptions.

Table 3.6

Dimensions of Supportive Online Assessment Environment Questionnaire (SOAEQ) Scale with their Items coding

Major Dimensions of SOAEQ	Each Dimension Total Items	Items Coding
Demographic Information	5	DI-1, DI-2, DI-3, DI-4, DI-5
Virtual Environment	14	VE1,VE2,VE3,VE4,VE5,VE6,VE7,VE8,VE9, VE10,VE11,VE12,VE13,VE14
Intellectual Environment	18	IE1,IE2,IE3,IE4,IE5,IE6,IE7,IE8,IE9,IE10, IE11,IE12,IE13,IE14,IE15,IE16,IE17,IE18
Emotional Environment	13	EE1,EE2,EE3,EE4,EE5,EE6,EE7,EE8,EE9, EE10,EE11,EE12,EE13
Open-Ended Questions	3	OEQ1, OEQ2, OEQ3

3.5.2 Description of Structured Written Interview Protocol Form (SWIPF) for Teachers

A Structured written interview protocol form (SWIPF) had been adapted from interview questions developed by (Rowley, 2019). The tool contained seven questions related to knowing benefits and challenges teachers experienced, whether they think of it as a user-friendly approach, its impacts, their preferable online assessment method, whether they think this technique beneficial for their students, and any suggestions they wanted to give etc. This tool had been used to answer research questions that were associated with teachers' experienced regarding formative online assessment at higher education level.

3.6 Research Instruments Validation

The validity of a research tool is considered essential for conducting a quality study. Both study tools (questionnaire and interview protocol) were validated by experts. They gave their suggestions and comments generously for improving questionnaire and

interview protocol and making these tools more understandable for university-level teachers and students. Some amendments were made under the supervision of experts and supervisor. For instance researcher rephrased some sentences for better understanding. Two validators were from internal university faculty and two validators were from other universities faculty as external.

3.7 Reliability of Questionnaire Tool (Pilot Testing)

For reliability purpose, questionnaire was pilot tested for improvement of its items. The aim of this process was to evaluate the research tool. 0.7 Or above deliberated as good/acceptable reliability of research tools stated by George and Mallery (2003). After the integration of changes recommended during validation by experts, the questionnaire was pilot tested. The rule of thumb for deciding the sample of pilot testing need to be minimum of 12 to 50 as cited by (Saunders et al., 2007). For that purpose, 60 undergraduate students were selected to fill questionnaire before starting final data collection process. Applied statistics found Cronbach's Alpha reliability of the overall questionnaire 0.908 with total of 45 items. It showed the questionnaire's excellent reliability.

Table 3.7a

Reliability of the Supportive Online Assessment Environment Questionnaire (SOAEQ)

Total Items	**45**
Cronbach's Alpha Value	.908

Dimension-wise reliability of study tool (SOAEQ) was too performed by researcher. The variable physical environment had good Cronbach's Alpha of .814 with total items of fourteen. The variable intellectual environment had good internal reliability

of .847 with total items of eighteen. The last variable emotional environment had also acceptable internal consistency of .705with total items of thirteen. Pilot testing results represent in given below table 3.7b.

Table 3.7b

Dimension-Wise Reliability of the Supportive Online Assessment Environment Questionnaire (SOAEQ)

Variables	Items	Crobach's Alpha
Physical Environment	14	.814
Intellectual Environment	18	.847
Emotional Environment	13	.705

3.8 Reliability of Interview Protocol

In qualitative data collection reliability means be honest and careful, being thorough, look at most practical and suitable ways of information gathering, proper questions wording, get credible and enough in-detail data, establishing rapport with respondents while carrying out research (Cohen et al., 2017). To finds the suitability of interview protocol's seven questions, researcher's first mock or pre-audio recorded/verbal interview was performed with two university teachers before final interview protocol data collection. There were few flaws in that tool, for instance, verbal interview duration was supposed to be high but actually, it was completed in 10 minutes and no useful information was getting through this. There was high background distraction (noises) during recording interview. Teachers were also not able to give specific separate timing in peaceful environment. Therefore scholar changes the pattern from audio semi-structured interview to structured written interview protocol. This change made tool more

understandable and convenient for use and also was helpful in collecting detailed quality study data.

3.8.1 Inter-Rater Reliability of the Qualitative Data

Inter-rater reliability demonstrates the consistency and degree of agreement of data among different coders to strengthen the value of the data (Hallgren, 2012). Qualitative data that was collected from interview protocol and open-ended survey questions were carefully transcribed, then verified those transcripts from another skilled qualitative researcher to check the inter-rater reliability of the transcripts. Some minor changes in the data were performed after the approval of expert. At first open coding then manual coding was done. Some portion of analysis was also provided to peer-researcher, she yielded an approximately 90% inter-rater agreement. The required minor changes were made after discussion.

3.9 Data Collection Procedure

A questionnaire was filled out by 370 participants out of a total student population of 5000 at six universities belonging to the Faculty of Social Sciences. The data were collected in two ways. The first method involved using a questionnaire developed in Google Forms and shared with students. The second method involved the researcher visiting the universities for data collection.

Structure written interview protocol data had been collected from seventeen university teachers out of a total of 169 which is almost 10% of the population. To arrive at data immersion or productive conclusion researcher personally visited universities to get answers to structure written interview protocol questions. Detail data collection procedure mentioned below.

To conduct the research study it an important for the researcher to show affiliation with the institution to which they belong. For that purpose, everyone needs university support letter. Firstly scholar sought support/consent letter from their university for study data collection.

Both qualitative and quantitative data were collected simultaneously. Within week researcher filled out questionnaires from sixty candidates of one university for pilot testing and also completed four structured written interview forms from teachers. Afterward, because of supporting team approachability to the institutions, they voluntarily gathered data from students of three universities and five teachers through Google forms over the time period of two weeks. At last researcher (herself) collected remaining data from undergraduates of two universities through Google forms and eight educators by visiting institutions within one and half weeks. There were roughly spent one month in data collection process. Researcher brother and sister-in-law served as supporting team and helped out during data collection procedure.

3.10 Data Analysis

The first instrument questionnaire contained closed-ended questions that represented four points Likert scale (strongly disagree, disagree, agree, and strongly agree) data had been analyzed by applying descriptive statistical analysis which was frequency and percentage to find answers to all quantitative research questions and arrive at a productive conclusion and also applied inferential statistics analysis which was independent sample t-test to get results related to first eight null hypotheses then exerted one way ANOVA and further Bonferroni Post Hoc Correction Test to get results of remaining four null hypotheses after testing.

In the second instrument interview protocol and questionnaire last two open-ended questions data had been analyzed by using thematic analysis. Researchers used the thematic analysis of six phases presented by Braun and Clarke, (2006). These six phases mentioned here: familiarization with data considered as the first phase, the second phase creation of categories and initial codes, the third phase themes searching, the fourth phase themes reviewing, the fifth phase naming then defining themes and the last one report producing. The researcher used whole this procedure to find the answers to qualitative research questions.

3.11 Ethical Considerations

In ethical consideration, the privacy of the participants (both teachers and students) was considered, and carefully looked for all factors that were against their privacy. The element of favouritism and biases was avoided. First verbal permission was taken from the people who were included in this research. The consent was acquired from each of the participants (teachers and students) before including them in the data collection process. There was no physical or emotional harm to the subject or anyone from this study. There was fine consideration such that to avoid researcher's personal opinions. The presentation of actual data, which the scholar got, include in the study.

Table 3.8

Research Objectives and Applied Statistical Analysis with Tests

Sr.no	Research Objectives	Statistical Analysis
1	To analyze the environment of formative online assessment at higher education level.	Descriptive Statistics Analysis (Frequency/Percentage)
2	To explore the experiences of university students regarding environment of formative online assessment at higher education level.	Thematic Analysis

3	To explore the experiences of university teachers regarding environment of formative online assessment at higher education level.	Thematic Analysis
4	To compare the experiences of students regarding formative online assessment on the basis of different demographic variables (sector, gender, and residential area).	Inferential Statistics Analysis (Independent Sample T-Test, One-Way ANOVA, Bonferroni Post Hoc Correction Test.

CHAPTER 4

DATA ANALYSIS AND INTERPRETATIONS

4.1 Introduction

This chapter discusses the data analysis, presentation, and interpretation of the results. On the account of this study, data was collected in order to answer the research questions and test the null hypotheses. The overall aim of this study was to analyse the environment of formative online assessment at the higher education level, compare the demographic variables and to explore the experiences of university students and teachers regarding the environment of formative online assessment at the higher education level. Collected data was interpreted in three forms; descriptive statistics analysis, inferential statistics analysis, and thematic analysis. In three parts the analysis and interpretation of data were executed. Part one deals with quantitative data analysis, which was according to the results of a questionnaire. A total of fifty structured closed-ended survey questions were developed to confirm the objectivity and rigor of the data and its results.

To accomplish first research objective frequencies, percentages were used, and to attain fourth objective independent sample t-test, and one-way ANOVA had been applied to each section (variable) data. Questionnaire statistics were presented in the form of tables and graphs after that careful analysis was ensured. Part two deals with qualitative data analysis which was based on the findings of the two open-ended survey questions. To achieve second objective, thematic analysis was done then formulated themes on both questions. Part three deals with qualitative data analysis which depends on the findings of the structured written interview protocol. To achieve third objective, thematic analysis

was performed on all seven questions of the interview then formulated themes demonstrated in the form of both tables and graphs.

4.2 Part One: Quantitative Data Analysis of Close-Ended Survey Questions

Table 4.1

Objectives, Quantitative Research Questions/Null Hypotheses and Analysis

Sr. no	Objective	RQ/Hypotheses	Respondents	Tool	Analysis
1.	OBJ. 1	RQ 1 (a, b, c)	Students	Questionnaire (Close-Ended Questions)	Descriptive Statistics Analysis
2.	OBJ. 4	H_O1 (a, b, c) H_O2 (a, b, c) H_O3 (a, b, c)	Students	Questionnaire (Close-Ended Questions)	Inferential Statistics Analysis

Objective 1: To analyse the environment of formative online assessment at higher education level.

RQ1. How efficacious is overall environment of formative online assessment at higher education level?

Table 4.2

Students' responses about the efficaciousness of overall environment dimensions during online formative assessment at higher education level

Variable	Dimensions	Inefficacious Average of Frequencies (N) Average of Percentages (%)	Efficacious Average of Frequencies (N) Average of Percentages (%)
	Virtual	204	166

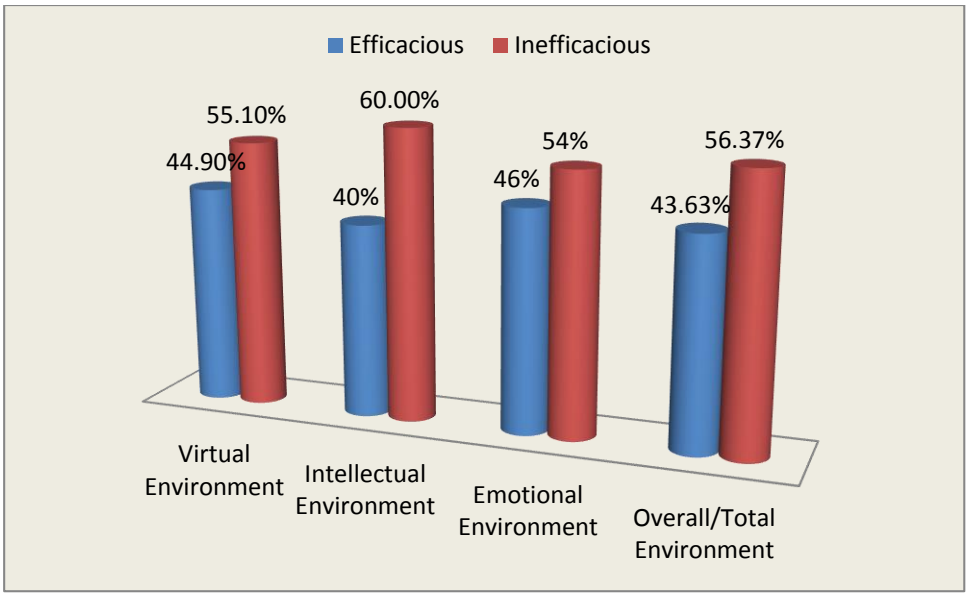
	Environment	(55.1%)	(44.9%)
	Intellectual	222	148
Environment	Environment	(60.00%)	(40%)
	Emotional	200	170
	Environment	(54%)	(46%)
	Overall	209	161
	Environment	(56.37%)	(43.63%)

Note. N represents number of participants (students). Inefficacious indicates jointly both Strongly Disagree (SDA-1) & Disagree (DA-2). Efficacious denotes jointly both Agree (A-3) & Strongly Agree (SA-4) respectively.

Table 4.2 illustrates the results of descriptive statistics (frequencies & percentages) to answer research question RQ1. There are a total of three dimensions on the basis of which the researcher finds efficaciousness of the overall environment during formative online assessment. In response to first category, 204 (55.1%) participants are dissatisfied with the general circumstances of virtual environment whereas 166 (44.9%) respondents are satisfied, from the total sample of 370. In reply to second classification, 222 (60.00%) students are unhappy with the whole situation of intellectual environment although only 148 (40%) learners are happy. In answer to third group, 200 (54%) undergraduates are displeased with the entire condition of emotional environment while on the contrary, 170 (46%) pupils are pleased. with regards to last dimension, 209 (56.37%) respondents considered overall or total environment inefficacious on the other hand 161 (43.63%) students experienced it as efficacious during online formative assessment. Therefore after analysing complete descriptive statistics data researcher concludes the answer of RQ1 is that the overall environment of formative online assessment at higher education level is not much efficacious for students.

Figure 4.1

Overall environment efficaciousness with its three dimensions; N = 370.



Note: Here efficacious mutually represents (both strongly agree-4 and agree-3), inefficacious jointly denotes (both strongly disagree-1 and disagree-2).

RQ1 (a): How much efficacious is virtual environment for online formative assessment at higher education level?

Table 4.3

Students' responses about the efficaciousness of virtual environment during formative online assessment at higher education level

Sr.no	**Virtual Environment Items**	**Inefficacious Frequencies (N) Percentages (%)**	**Efficacious Frequencies (N) Percentages (%)**
1	Online Assessment Design (Class Size)	239 (64.6%)	131 (35.4%)
2	Technological Set-up	248 (67%)	122 (33%)
3	Quality Facilitation of (LMS)	283 (76.5%)	87 (23.5%)
4	Online Tutorials	101 (27.3%)	269 (72.7%)
5	Technical Support and Training	268 (72.4%)	102 (27.6%)
6	Online Teachers Accessible	254	116

		(68.7%)	(31.3%)
7	Online Material (PDF Files, PPT, A-V Aids)	110 (29.7%)	260 (70.3%)
8	Own Devices	93 (25.2%)	277 (74.8%)
9	Electricity Availability	305 (82.5%)	65 (17.5%)
10	Network /Wi-Fi Accessibility	308 (83.3%)	62 (16.7%)
11	Distraction (Noise) Free Environment	294 (79.5%)	76 (20.5%)
12	User Friendly Assessment (Mobile)	110 (29.7%)	260 (70.3%)
13	Efficient in Time	119 (32.2%)	251 (67.8%)
14	Efficient in Money	121 (32.7%)	249 (67.3%)
15	**Overall Virtual Environment**	**204 (55.1%)**	**166 (44.9%)**

Table 4.3 illustrates results in the form of descriptive statistics (frequencies & percentages) to find the answer of research question RQ1 (a) which is based on efficaciousness of virtual environment during formative online assessment. This category contains a total of fourteen items. Students' replies on a 4-point Likert scale questionnaire, however, in interpretation, the researcher merges two Likert's into one to make analysis easy and understandable for audience such as strongly disagree-1 and disagree-2 are denoted inefficacious whereas agree-3 and strongly agree-4 are denoted efficacious. According to Bruhl et al., (2008), a percentage distribution table is presented where below 50% contemplate as unacceptable on the other hand above 50% consider acceptable. On the first item 239 (64.6%) students disagree, they do not think group size is appropriate for taking an online assessment. on second element 248 (67%) respondents disagree, they think technical setup is not given by university to teachers for online assessment handling. In third component 283 (76.5%) participants disagree; they don't

have access to a quality learning management system for giving online assessments. On fourth factor 269 (72.7%) learners agree, that yes they found online tutorial videos helpful for giving virtual assessments. On fifth item 268 (72.4%) undergraduates disagree; they do not receive technical training and support that help them in giving e-assessment.

On sixth element 254 (68.7%) candidates disagree, they experienced that the teachers approachability is not easy due to network issues. On seventh component 260 (70.3%) students agree, they found online material helpful to make e-assessment clear. On eighth factor 277 (74.8%) respondents agree, that they are equipped with essential electronic devices. On ninth item 305 (82.5%) participants disagree and highlighted that electricity is mostly unavailable in their residential areas. In tenth element 308 (83.3%) learners disagree; they do not get a high-quality internet facility off-campus. On eleventh component 294 (79.5%) undergraduates disagree, as they faced distraction due to a noisy environment in the course of e-assessment. In twelfth factor 260 (70.3%) candidates agree, that online-assessment is convenient (user-friendly) for everyone. On thirteen element 251 (67.8%) students agree, yes this evaluation approach is time-saving. On fourteen component 249 (67.3%) learners agree, yes this assessment method is economical. There is a total of eight items where disagree percentage is high alternatively remaining six items where the agreed percentage is high. the ratio of disagree responses has been higher than agreed. Lastly 204 (55.1%) participants think the overall virtual environment is inefficacious however 166 (44.9%) respondents experienced it as efficacious, from the total sample of 370. Correspondingly the researcher concludes the answer of research RQ1 (a) is that; there is not much efficacious virtual environment during online formative assessment at higher education level for students.

RQ1 (b). How much efficacious is intellectual environment for online formative assessment at higher education level?

Table 4.4

Students' responses about the efficaciousness of intellectual environment during formative online assessment at higher education level

Sr.no	Intellectual Environment Items	Inefficacious Frequencies (N) Percentages (%)	Efficacious Frequencies (N) Percentages (%)
1	Clarity of Objectives	252 (68.1%)	118 (31.9%)
2	Practice Tutorials	290 (78.3%)	80 (21.7%)
3	Regular Reminders to Activities (Assessment)	93 (25.1%)	277 (74.9%)
4	Clear Information & Instructions	122 (33%)	248 (67%)
5	Time for Preparation	244 (66%)	126 (34%)
6	Online Resources	274 (74%)	96 (26%)
7	Individual Learning Style	299 (80.8%)	71 (19.2%)
8	Comfortable Assessment Culture	135 (36.5%)	235 (63.5%)
9	Teachers Audibility	261 (70.5%)	109 (29.5%)
10	Questioning Method	86 (23.3%)	284 (76.7%)
11	Self-Assessment	237 (64.1%)	133 (35.9%)
12	Peer-Assessment	297 (80.3%)	73 (19.7%)
13	Active Involvement	245 (66.2%)	125 (33.8%)
14	Monitor Learning	249 (67.3%)	121 (32.7%)
15	Feedback	166 (44.9%)	204 (55.1%)
16	Problem Solving Base Assessment	231 (62.5%)	139 (37.5%)
17	Consistent Teaching Styles	240 (64.9%)	130 (35.1%)
18	Reliable Information Communication Technology (ICT)	275 (74.3%)	95 (25.7%)
19	**Overall Intellectual Environment**	**222 (60.005%)**	**148 (40%)**

Table 4.4 shows results by means of descriptive statistics (frequencies & percentages) to obtain the answer to research question RQ1 (b) which is connected with the efficaciousness of intellectual environment during formative online assessment. This variable contains a total of eighteen items. Students' replies on a 4-point Likert scale questionnaire, however in interpretation, the researcher integrate two Likerts into one to make analysis easy and understandable for audience. On the first item 252 (68.1%) students disagree; teachers do not clarify online-assessment objectives. On second element 290 (78.3%) respondents disagree; they do not experience rehearsing e-assessments before final online exams. On third component 277 (74.9%) participants agree; yes teachers regularly reminded their assessment activities. On fourth factor 248 (67%) learners agree, that yes tutors gave instructions/information regarding e-assessment on time. On fifth item 244 (66%) undergraduates disagree; they do not receive appropriate time for online-assessment preparation. On sixth element 274 (74%) candidates disagree; teachers do not use internet resources properly for online-assessment. On seventh component 299 (80.8%) students disagree, that teachers do not consider tutees' individual learning styles when giving e-assessment. On eighth factor 235 (63.5%) respondents agree; yes they felt comfortable throughout online assessment. On ninth item 261 (70.5%) participants disagree, they highlighted that in many instances instructor's voice is not reachable to us.

On tenth element 284 (76.7%) learners agree; yes teachers mostly used the questioning method as an assessment tool. On eleventh component 237 (64.1%) undergraduates disagree; teachers do not promote self-assessment in students. On twelfth factor 297 (80.3%) candidates disagree, they do not go through peer-assessment experience in online sessions. On thirteen element 245 (66.2%) students disagree, educators do not ensure the active involvement of every pupil in an online discussion. On

fourteen component 249 (67.3%) learners disagree teachers do not monitor tutees' learning through online assessment. On fifteen item 204 (55.1%) participants agree that yes teachers provide feedback on time. On sixteen factor 231 (62.5%) respondents disagree; they do not experience an instructor forming problem-solving-based e-assessments. On seventeen element 240 (64.9%) candidates disagree, they do not feel consistency between teaching and virtual assessment. In last eighteen component 275 (74.3%) students disagree they think technology (ICT) is not reliable. There is a total of thirteen items where the disagree percentage is high otherwise remaining five items where the agreed percentage is high, the ratio of disagree responses has been higher than agree. Lastly 222 (60.00%) participants think the overall intellectual environment is inefficacious vice versa 148 (40%) respondents experienced it as efficacious, from the total sample of 370. respectively the researcher concludes answer of research RQ1 (b) is that intellectual environment is not much efficacious during online formative assessment at higher education level for students.

RQ1 (c). How much efficacious is emotional environment for online formative assessment at higher education level?

Table 4.5

Students' responses about the efficaciousness of emotional environment during online formative assessment at higher education level

Sr.no	**Emotional Environment Items**	**Inefficacious Frequencies (N) Percentages (%)**	**Efficacious Frequencies (N) Percentages (%)**
1	Follow Etiquette	106 (28.7%)	264 (71.3%)
2	Learning Responsibility	144 (38.9%)	226 (61.1%)
3	Positive Attitude	252 (68.1%)	118 (31.9%)
4	No Anxiety	256 (69.2%)	114 (30.8%)

5	Comfortable	107 (29%)	263 (71%)
6	Trust LMS Confidentiality Policy	143 (38.7%)	227 (61.3%)
7	Technology Adaption	191 (51.6%)	179 (48.4%)
8	Emotional Support	298 (80.5%)	72 (19.5%)
9	Mentoring by Teacher	286 (77.3%)	84 (22.7%)
10	Confidence	171 (46.2%)	199 (53.8%)
11	Set High Results Expectations	110 (29.8%)	260 (70.2%)
12	Appreciation	260 (70.3%)	110 (29.7%)
13	Adequate Time to Complete Tasks	274 (74%)	96 (26%)
14	**Overall Emotional Environment**	**200 (54%)**	**170 (46%)**

Table 4.5 displays results in the form of descriptive statistics (frequencies & percentages) to find the answer of research question RQ1 (c) which is related to efficaciousness of emotional environment during formative online assessment. This variable contains a total of thirteen items. Students' responses on 4-points Likert scale, however in interpretation, the researcher combines two Likerts into one to make analysis easy and understandable for audience. On the first item 264 (71.3%) students agree; yes they follow online basic etiquette. On second element 226 (61.1%) respondents agree; yes they take all their learning responsibility for online assessment. On third component 252 (68.1%) participants disagree, they don't have a positive attitude toward online assessment. On fourth factor 256 (69.2%) learners disagree yes they feel anxiety when giving online assessments. On fifth item 263 (71%) undergraduates agree, that yes they feel comfortable during online assessment. On sixth element 227 (61.3%) candidates agree, that they trust online LMS privacy policy system of their university. On seventh

component 191 (51.6%) students are disagree. that they do not adapt to the technology used for online assessment.

On eighth factor 298 (80.5%) respondents disagree; they do not get emotional support from department/teachers during online assessment. On ninth item 286 (77.3%) participants disagree. that teachers do not provide mentoring to students to solve any issue during assessment. On tenth element 199 (53.8%) learners agree, yes they confidently complete their online assessment. On eleventh component 260 (70.2%) undergraduates agree, yes they have high expectations from online assessment results. On twelfth factor 260 (70.3%) candidates disagree; they do not receive appreciation in online assessments. On thirteen element 274 (74%) students disagree; they do not get adequate time to complete assessments/tasks. There is a total of seven items where the disagree percentage is high alternatively remaining six items where the agreed percentage is high, the ratio of disagree responses has been higher than agree. Lastly 200 (54%) participants think the overall emotional environment is inefficacious vice versa 170 (46%) respondents experienced it as efficacious, from the total sample of 370. therefore the researcher concludes answer of research RQ1 (c) is that there is not much efficacious emotional environment during an online formative assessment at higher education level for students.

Objective 4: To compare the experiences of students regarding formative online assessment on the basis of different demographic variables (sector, gender, and residential area).

Ho1. There is no significant difference in the experiences of public and private sector universities students on account of overall environment of formative online assessment.

Table 4.6

Sector-wise comparison of overall environment during online formative assessment at higher education level

Variables	Sector	(N)	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Overall	public	193	97.63	24.942	-5.532	368	.000
Environment	private	177	112.32	26.123			

Note: The mean difference is significant at the 0.05 level.

Table 4.6 exhibits results of independent sample t-test regarding overall environment. This test is used to statistically compare the means of two samples. These two groups are public and private sector universities. The total number of respondents from public sector is (193) and participants from private sector are (177) donated by symbol N, next row comprises of mean (average) of public and private sector data set, whole data is close around mean value indicating a low standard deviation value whereas all data spread out far from mean value indicates high std. Deviation value. t-value calculates the size of difference between means of two groups, if $|t| \geq 1.96$ considers significant/acceptable. A negative t-value indicates an effect in reverse direction. For two groups degree of freedom is sample size minus 2 (370-2 = 368). sig. also known as probability-value (p-value) helps out in defining whether the mean difference between two groups is significant statistically.

With the help of table 4.6 interpretations of variable has given as follows. Results allied with Ho1 determines that p-value is ($.000 < 0.05$) with a t-value = -5.532 which is greater than 1.96 (ignore minus sign) declaring a high variance between means of two groups. Hence researcher rejects null hypothesis because there is significant difference in the experiences of public and private sector universities students on account of overall environment of formative online assessment at higher education level. In addition, outcomes report the higher mean score value of private sector universities (M = 112.32, SD = 26.123) point out that private sectors are highly affected by overall environment

during formative online assessment at higher education level as compared to public sector universities (M = 97.63, SD = 24.942).

Ho1(a). There is no significant difference in the experiences of public and private sector universities students with reference to virtual environment for online formative assessment.

Table 4.7

Sector-wise comparison of virtual environment during online formative assessment at higher education level

Variables	Sector	(N)	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Virtual	public	193	28.97	9.784	-7.605	368	.000
Environment	private	177	37.13	10.859			

Note. N represents number of participants (students), df denotes degree of freedom and t symbolizes t value respectively.

With the help of table 4.7 interpretations of variable has given as follows. Results related to Ho1 (a) illustrates that p-value is (.000 < 0.05) with a t-value = -7.605 which is greater than 1.96 (neglect minus sign) indicating a high variation between means of two groups. Thus researcher rejects null hypothesis for the reason that there is significant difference in the experiences of public and private sector universities students with reference to virtual environment for online formative assessment at higher education level. Furthermore, results reveal that the higher mean score value of private sector universities (M = 37.13, SD = 10.859) indicates that private sectors have been more affected by virtual environment during a formative online assessment at a higher education level as compared to public sector universities (M = 28.97, SD = 9.784).

Ho1(b). There is no significant difference in the experiences of public and private sector universities students with respect to intellectual environment of online formative assessment.

Table 4.8

Sector-wise comparison of intellectual environment during online formative assessment at higher education level

Variables	Sector	(N)	Mean	Std. Deviation	t	df	Sig. (2-tailed)
Intellectual Environment	public	193	41.35	13.638	.871	368	.384
	private	177	40.06	14.749			

Note: The mean difference is significant at the 0.05 level.

With the help of table 4.8 interpretations of variable has given as follows. Outcomes associated with Ho1 (b) shows that p-value is (.384 > 0.05) with a t-value = .871 which is smaller than 1.96 specifying no difference between means of two groups. Therefore researcher fails to reject null hypothesis since there is no significant difference in the experiences of public and private sector universities students with respect to intellectual environment of online formative assessment at higher education level.

Ho1(c). There is no significant difference in the experiences of public and private sector universities students with regard to emotional environment for online formative assessment.

Table 4.9

Sector-wise comparison of emotional environment during online formative assessment at higher education level

Variables	Sector	(N)	Mean	Std. Deviation	t	df	Sig. (2-tailed)

Emotional	public	193	27.32	9.268	-7.877	368	.000
Environment	private	177	35.13	9.810			

Note: The mean difference is significant at the 0.05 level.

With the help of table 4.9 interpretations of variable has given as follows. Outcomes related with Ho1(c) demonstrates that the p-value is (.000 < 0.05) with a t-value = -7.877 which is greater than 1.96 (disregard minus sign) pointing out a high deviation between means of two groups. Consequently, the researcher rejects null hypothesis as there is significant difference in the experiences of public and private sector universities students with regard to emotional environment for online formative assessment at higher education level. Additionally, results report that private sector universities (M = 35.13, SD = 9.810) have been more affected due to emotional environment during formative online assessment at higher education level than public sector universities (M = 27.32, SD = 9.268).

Ho2. There is no significant difference in the experiences of male and female students on account of overall environment of formative online assessment.

Table 4.10

Gender-wise comparison of overall environment during online formative assessment at higher education level

Variables	**Gender**	**(N)**	**Mean (M)**	**Std. Deviation (SD)**	**t**	**df**	**Sig. (2-tailed)**
Overall	male	168	95.50	25.114	-6.377	368	.000
Environment	female	202	112.28	25.267			

Note: The mean difference is significant at the 0.05 level.

Table 4.10 displays results of independent sample t-test regarding overall environment. This test is used to statistically compare the means of two samples. These two groups are male and female students. The total number of female respondents is (202) and male participants are (168) donated by symbol N, next row comprises of mean (average) of male and female data set, whole data is close around mean value indicating a low standard deviation value whereas all data spread out far from mean value indicate high std. Deviation value. t-value calculates the size of difference between means of two groups, if $|t| \geq 1.96$ consider significant/acceptable. A negative t-value indicates an effect in reverse direction. For two groups degree of freedom is sample size minus 2 (370-2 = 368). sig. also known as probability-value (p-value) helps out in defining whether the mean difference between two groups is significant statistically.

From table 4.10 interpretations of variable has given as follow. Results allied with Ho2 determines that p-value is ($.000 < 0.05$) with a t-value = -6.377 which is greater than 1.96 (ignore minus sign) declaring a high variance between means of two groups. Hence researcher rejects null hypothesis for the reason that there is significant difference in the experiences of male and female students on account of overall environment of formative online assessment at higher education level. In addition, outcomes report that female students (M = 112.28, SD = 25.267) are highly effected with overall environment during formative online assessment at higher education level than male students (M = 95.50, SD = 25.114).

Ho2(a). There is no significant difference in the experiences of male and female students due to virtual environment of formative online assessment.

Table 4.11

Gender-wise comparison of virtual environment during online formative assessment at higher education level

Variables	Gender	(N)	Mean (M)	Std. Deviation (SD)	t	df	Sig. (2-tailed)
Virtual	male	168	28.23	10.140	-7.944	368	.000
Environment	female	202	36.73	10.337			

Note. N represents number of participants (students), df denotes degree of freedom and t symbolizes t value respectively.

From table 4.11 interpretations of variable has given as follow. Results related to Ho2(a) illustrates that p-value is (.000 < 0.05) with t-value = -7.944 which is greater than 1.96 (neglect minus sign) indicates high variation between means of two groups. Thus researcher reject null hypothesis because there is significant difference in the experiences of male and female students due to virtual environment of formative online assessment at higher education levels. Furthermore, results reveal that female students (M = 36.73, SD = 10.337) have significantly experienced a greater observed effect of virtual environment during formative online assessment at higher education level than male students (M = 28.23, SD = 10.140).

Ho2(b). There is no significant difference in the experiences of male and female students caused by intellectual environment of formative online assessment.

Table 4.12

Gender-wise comparison of intellectual environment during online formative assessment at higher education level

Variables	Gender	(N)	Mean (M)	Std. Deviation (SD)	t	df	Sig. (2-tailed)
Intellectual	male	168	40.52	14.339	-.265	368	.791

Environment	female	202	40.91	14.071			

Note: The mean difference is significant at the 0.05 level.

From table 4.12 interpretations of variable has given as follow. Outcomes associated with Ho2 (b) shows that p-value is (.791 > 0.05) with t-value = -.265 which is smaller than 1.96 (disregard minus sign) specify no difference between means of two groups. Therefore researcher fail to reject null hypothesis since **t**here is no significant difference in the experiences of male and female students caused by intellectual environment of formative online assessment at higher education level.

Ho2(c). There is no significant difference in the experiences of male and female students because of emotional environment of formative online assessment.

Table 4.13

Gender-wise comparison of emotional environment during online formative assessment at higher education level

Variables	**Gender**	**(N)**	**Mean (M)**	**Std. Deviation (SD)**	**t**	**df**	**Sig. (2-tailed)**
Emotional	male	168	26.75	9.908	-7.929	368	.000
Environment	female	202	34.63	9.189			

Note: The mean difference is significant at the 0.05 level.

From table 4.13 interpretations of variable has given as follow. Outcomes related with Ho2(c) demonstrates that the p-value is (.000 < 0.05) with a t-value = -7.929 which is greater than 1.96 (neglect minus sign) pointing out a high deviation between means of two groups. Consequently, the researcher rejects null hypothesis as **t**here is significant difference in the experiences of male and female students because of emotional environment of formative online assessment at higher education level. Additionally,

results report that female students (M = 34.63, SD = 9.189) have been highly affected due to emotional environment during formative online assessment at higher education level than male students (M = 26.75, SD = 9.908).

H_o3. There is no significant difference in the experiences of urban, suburban and rural areas students on account of overall environment for online formative assessment.

Table 4.14a

Residential area-wise comparison of overall environment during online formative assessment at higher education level

Factor	Residential Area	N	Mean	F	Sig.
Overall Environment	Urban	199	98.77	17.624	.000
	Suburban	55	101.71		
	Rural	116	116.16		

Note: Applied One-Way ANOVA. The mean difference is significant at the 0.05 level.

Table 4.14a shows results of one-way ANOVA to find mean difference between more than two groups. Table description; Start with first-row containing factor. Second last-row consists of F-value obtained by dividing difference of mean between samples with a variation of mean within sample; every time F value is high conveys a high variation between and within sample. F-value is inversely proportionated to p-value when f-value increases p-value decreases. Fail to reject null hypothesis whenever F-value is close to 1.0 otherwise reject it. Last-row sig. also known as probability-value (p-value) helps out in defining whether the mean difference between more than two groups is significant statistically.

Begin interpretations and figure out effects of all four null hypotheses one by one. In figure 4.14a results about Ho3 defines that p-value is (.000 < 0.05) with F-value = 17.624 which is also greater than 1.0 point out high dissimilarity between groups. Hence

researcher reject null hypothesis because there is significant difference in the experiences of urban, suburban and rural areas students on account of overall environment for online formative assessment at higher education level. In simplified manner those students who are situated in different residential areas like urban (M = 98.77), suburban (M = 101.71) and rural (M = 116.16) underwent overall diverse environment during formative online assessment at higher education level.

Table 4.14b

Multiple Comparison analysis of residential area groups associated to overall environment of online formative assessment at higher education level

Factor	**(I) Residential Area**	**(J) Residential Area**	**Mean Difference (I-J)**	**Sig.**
Overall Environment	Urban	Suburban	-2.940	1.000
		Rural	-17.395*	.000
	Suburban	Urban	2.940	1.000
		Rural	-14.455*	.002
	Rural	Urban	17.395*	.000
		Suburban	14.455*	.002

Note: Applied Bonferroni Post Hoc Correction Test. Mean difference also indicates as (MD). *. Denotes that the mean difference is significant at the 0.05 level

For further explanation doing multiple comparisons in order to examine which groups (urban, suburban, rural) shows a significant difference, researcher used the Bonferroni Post-Host Correction Test. The outcomes are depicted in Table 4.14b. The results reveal that there is a highly significant mean score difference found in rural group (P value is .000 < 0.05, MD = ±17.395*) in comparison with other both groups urban and suburban. Likewise, results indicate that there is a significant mean score difference found in suburban group (P value is .002 < 0.05, MD = ±14.455*) as compared to urban group

but less than rural group. However, outcomes also demonstrate that there is no significant mean score difference found in urban group (P-value is 1.000 > 0.05, MD = ±2.940) when compared with other two groups (suburban and rural). Additionally in simplified term results illustrates that those students who belong to rural areas are affected more on account of overall environment during online formative assessment at higher education level in comparison to those students who live in urban and suburban areas.

H_o3(a). There is no significant difference in the experiences of urban, suburban and rural areas students with regard to virtual environment for online formative assessment.

Table 4.15a

Residential area-wise comparison of virtual environment during online formative assessment at higher education level

Factor	Residential Area	N	Mean	F	Sig.
	Urban	199	29.81		
Virtual	Suburban	55	32.56	24.029	.000
Environment	Rural	116	38.27		

Note: Applied One-Way ANOVA. The mean difference is significant at the 0.05 level.

In table 4.15a results related to Ho3 (a) illustrates that p-value is (.000 < 0.05) with F-value = 24.029 which is greater than 1.0 indicates high variation between groups. Thus researcher reject null hypothesis because there is significant difference in the experiences of urban, suburban and rural areas students with regard to virtual environment for online formative assessment at higher education level. Basically those students who belong to different residential areas such as urban (M = 29.81), suburban (M = 32.56) and rural (M = 38.27) went through diverse virtual environment during formative online assessment at higher education level.

Table 4.15b

Multiple Comparison analysis of residential area groups related to virtual environment in online formative assessment at higher education level

Factor	(I) Residential Area	(J) Residential Area	Mean Difference (I-J)	Sig.
	Urban	Suburban	-2.750	.254
		Rural	-8.453*	.000
Virtual	Suburban	Urban	2.750	.254
Environment		Rural	-5.704*	.003
	Rural	Urban	8.453*	.000
		Suburban	5.704*	.003

Note: Applied Bonferroni Post Hoc Correction Test. Mean difference also indicates as (MD). *. Denotes that the mean difference is significant at the 0.05 level

For further explanation doing multiple comparisons in order to examine which groups (urban, suburban, rural) shows a significant difference, researcher used the Bonferroni Post-Host Correction Test. The outcomes are depicted in Table 4.15b. The results reveal that there is a highly significant mean score difference found in rural group (P value is .000 < 0.05, MD = ±8.453*) in comparison with other both groups urban and suburban. Likewise, results indicate that there is a significant mean score difference found in suburban group (P value is .003 < 0.05, MD = ±5.704*) as compared to urban group but less than rural group. However, outcomes also demonstrate that there is no significant mean score difference found in urban group (P-value is .254 > 0.05, MD = ±2.750) when compared with other two groups (suburban and rural). Moreover in simplified manner results illustrates that those students who belong to rural areas are affected more because of virtual environment during online formative assessment at higher education level in comparison to those students who live in urban and suburban areas.

H_o3(b). There is no significant difference in the experiences of urban, suburban and rural areas students owing to intellectual environment for online formative assessment.

Table 4.16

Residential area-wise comparison of intellectual environment during online formative assessment at higher education level

Factor	Residential Area	N	Mean	F	Sig.
	Urban	199	40.86		
Intellectual	Suburban	55	38.18	1.183	.307
Environment	Rural	116	41.72		

Note: Applied One-Way ANOVA. The mean difference is significant at the 0.05 level.

In figure 4.16 end results associated with Ho3 (b) demonstrates that p-value is (.307 > 0.05) with F-value = 1.183 which is close to 1.0 specify low deviation between groups. Therefore researcher fail to reject null hypothesis since there is no significant difference in the experiences of urban, suburban and rural areas students owing to intellectual environment for online formative assessment.at higher education level.

H_o3(c). There is no significant difference in the experiences of urban, suburban and rural areas students due to emotional environment throughout online formative assessment.

Table 4.17a

Residential area-wise comparison of emotional environment during online formative assessment at higher education level

Factor	Residential Area	N	Mean	F	Sig.
	Urban	199	28.10		
Emotional	Suburban	55	30.96	25.588	.000
Environment	Rural	116	36.17		

Note: Applied One-Way ANOVA. The mean difference is significant at the 0.05 level.

In figure 4.17a outcomes linked with Ho3(c) determines that p-value is (.000 < 0.05) with F-value = 25.588 that is greater than 1.0 prove high deviance between groups. Consequently researcher reject null hypothesis as there is significant difference in the experiences of urban, suburban and rural areas students due to emotional environment throughout online formative assessment at higher education level. In simple language those students who are living in urban (M = 28.10), suburban (M = 30.96) and rural (M = 36.17) residential areas experienced dissimilar emotional environment during formative online assessment at higher education level.

Table 4.17b

Multiple Comparison analysis of residential area groups related to emotional environment in online formative assessment at higher education level

Factor	**(I) Residential Area**	**(J) Residential Area**	**Mean Difference (I-J)**	**Sig.**
Emotional Environment	Urban	Suburban	-2.868	.157
		Rural	-8.077*	.000
	Suburban	Urban	2.868	.157
		Rural	-5.209*	.003
	Rural	Urban	8.077*	.000
		Suburban	5.209*	.003

Note: Applied Bonferroni Post Hoc Correction Test. Mean difference also indicates as (MD). *. Denotes that the mean difference is significant at the 0.05 level

For further explanation doing multiple comparisons in order to examine which groups (urban, suburban, rural) shows a significant difference, researcher used the Bonferroni Post-Host Correction Test. The outcomes are depicted in Table 4.17b. The results reveal that there is a highly significant mean score difference found in rural group (P value is .000 < 0.05, MD = ±8.077*) in comparison with other both groups urban and

suburban. Likewise, results indicate that there is a significant mean score difference found in suburban group (P value is .003 < 0.05, MD = ±5.209*) as compared to urban group but less than rural group. However, outcomes also demonstrate that there is no significant mean score difference found in urban group (P-value is .157 > 0.05, MD = ±2.868) when compared with other two groups (suburban and rural). Furthermore in simple word results illustrates that those students who belong to rural areas are affected more due to emotional environment during online formative assessment at higher education level in comparison to those students who live in urban and suburban areas.

4.3 Part Two: Qualitative Data Analysis of Open-Ended Survey Questions

Table 4.18

Objectives, Qualitative Research Questions, Respondents, Tools and Analysis

Sr. no	Objective	Research Questions	Respondents	Tool	Analysis
1.	OBJ. 2	RQ 2 RQ 3	Students	Questionnaire (Open-Ended Questions)	Thematic Analysis
2.	OBJ. 3	RQ 4 RQ 5	Teachers	Interview Protocol	Thematic Analysis

Objective 2: To explore the experiences of university students regarding environment of formative online assessment at higher education level.

RQ2. What benefits are experienced by university students in relation to formative online assessment at higher education level?

RQ3. What challenges are experienced by university students in relation to formative online assessment at higher education level?

Table 4.19

Benefits experienced by students in relation to formative online assessment at higher education level.

Themes	Sub-Themes	Benefits Experienced by Students Description Quotations of Students Significant Statements
Time Saving	Time flexibility.	"Online formative assessment gives students more flexibility to learn in their own time, which is often lacking with traditional assessment settings."
	No time restriction.	"The most favourable aspects of formative online assessment are that we have more time in the home and no time restriction for eating and drinking."
	Don’t waste time.	"Online assessment does not waste one’s time and a person does not have to be bound by time."
	No time unity.	"Unity of time is not necessary, online assessment takes less time to get ready for the class."
	Time efficient.	"More efficient in terms of time, online assessments help us to consume less time during assignments or quiz typing rather than writing on paper."
	Easy time management.	"Time management is easy because you have to save more time while studying online than the on-campus schedule."
No Traveling	Avoid transportation issues.	"You don’t have to travel and can give it on the go; you also avoid any transportation issue."
	Don’t go to university.	"Not traveling early morning, waking up, and getting ready."
	Traveling time save.	"Traveling time was saved because you do not have to go to university."
Economical	Save traveling cost.	"The online assessment approach saves costs like traveling to university."
		"Online evaluation method is economical for students."
		"This practice helps out him in saving Transportation

		money."
Promote Comfort Zone	Don’t leave home. Take classes from anywhere. Don’t get up early morning. Be relaxed/take rest. Comfortable environment. Giving exams become easy.	"We do not have to leave our comfort zones, rest and take classes accordingly." "You do not have to get up early in the morning and leave your bed to go to university." "The best aspect is we can take a class with one touch; be relaxed and no tension to rush to university." "Most favourable aspect was that we were at home; we were able to have a cup of tea with snacks while comfortably attending the session!" "It was quite easy and comfortable to take online assessments or exams from home." "The most favourable aspect of formative online assessment is that it provides a comfortable environment. You can get knowledge while remaining in your bed but you can have no other practical experience."
Flexibility of Place	No place restriction. Recorded lecturers available.	"Recorded lectures are available anytime anywhere. There is no restriction in terms of a place for undertaking the assessment." "Unity of place is not necessary when completing an online assessment."
Score High Marks	CGPA improve. Get desirable scores.	"Student has the opportunity to get good grades and improve their CGPA." "Formative online assessment incorporates the opportunity for a second chance. This means the student tries until they get their desirable high scores."
Stress Free	No pressure. Comfortable. Tension free environment.	"It is more comfortable and stress-free as compared to in-class assessment, for the reason that we do not have much pressure in contrast with paper-based one." "The most favourable aspects are Students free from the pressured environment of examination."

Activity Oriented Session	Participative online activities. Increase students' engagement. Positive/ Satisfactory learning experience.	"Some teachers motivate students to take active participation in different class activities for instance through question answers, quizzes, and games." "This method increase student engagement in a class by using activities that are based on the teacher instruction technique is really favourable." "I experience more enjoyment in online classes as compared to offline classes as learning take place at a positive level."
Convenient for Everyone	Reasonable for job person. Available for everyone (remote areas). Promote distance and easy learning.	"Those students who are doing the part-time jobs can do their work or other tasks as well as continue study without facing any physical attendance issues." "I think it is very good for students because they are short, easy, to the point and available for everyone." "I think sometimes it is the easy way out for those teachers/students who are living in remote areas to continue their learning and teaching process without leaving their home towns."
Timely Feedback	Instant and continue feedback.	"The most beneficial aspects of formative assessment are to providing timely feedback." "This technique useful to check students' knowledge and provide instant and continuous feedback to them such as which subject area needs hard work and how to do it."
Get Extra Study Materials	Additional study resources. Get more knowledge.	"In formative online assessment students get more knowledge and helping material apart from syllabus book, which is really helpful in terms of this." "Teachers during Teams or Zoom classes provide links to a number of websites such as edu.pk.com. EduPodia.com etc. for studies other than just mailing PowerPoint slides."
Build Confidence	Communication becomes easy.	"For those students who have social anxiety, it is easy to communicate and participate in class during the online

	Increase students' participation.	assessment." "Online evaluation install or upgrades confidence in students, they discuss their concerns related to tasks with their teachers easily in the chat box."
Develop Self Study Habit	Become Self-regulated learner. Create learning responsibility.	"It make students self-regulated learners, and that helps them in improving their academic performance." "Online study creates learning responsibility in him and inspires him to do a self-study by scrolling different online study resources for assignments/project preparation."

Table 4.19 represents the qualitative data of one open-ended survey question by applying thematic analysis to answer research RQ2 which is related to describing benefits experienced by university students during the formative online assessment at higher education level. The researcher collected qualitative data from 50 participants. The selected sample size is supported by giving reference to Dworkin (2012) the well-known scholar who suggests a sample size of 5 to 50 in the qualitative study while Morse (1994) recommends 30 to 50 as well. After gathering the whole data researcher creates codes and from these codes finalized thirteen themes to answer the research question. Table 4.19 consists of two portions; in the first column write down theme headings, and in the last column transcribe quotations of significant statements given by students.

Of these thirteen themes; the first one is time-saving. Learners think that online assessment provides them with time flexibility. The second category is no traveling. Respondents replies in support of this theme and said they can avoid transportation issues. Third heading is economical; participants said yes this approach is cost-effective. The fourth theme has related to promoting comfort zone, undergraduates stated they experienced a comfortable environment during the online assessment. The fifth element has associated with the flexibility of place, students responded; that they can do their

assessment from anywhere. In the sixth component based on scoring high marks, tutees indicate it's provided a golden chance for some pupils to get good grades. The seventh item is stress-free; in which candidates answer that they are tension free from pressurizing environment of exams.

The eighth theme is activity-oriented sessions; students appreciate the activities carried out during online lectures by a few instructors. The ninth category has linked with convenience for everyone; undergraduates think whether a person doing the job or living in hilly areas can give an assessment conveniently. The tenth element is timely feedback; pupils specify they get quick feedback. Eleventh category allied to getting extra study material, students point out received additional reading resources. The twelfth theme is building confidence; respondents commented those students who have social anxiety or introvert, easily participate in virtual sessions. The last category is developing self-study habits, candidates get inspired toward self-learning. Hence after reporting themes analysis, the answer of research RQ2 is yes, the online formative assessment at the higher education level is beneficial in terms of the following themes which are given above in Table 4.19.

Table 4.20

Challenges experienced by students in relation to formative online assessment at higher education level.

Themes	**Sub-Themes**	**Challenges Experienced by Students** **Description** **Quotations of Students Significant Statements**
No productive learning	No quality/effective learning. Lack of understanding.	"The unfavourable aspect is that there is no productive, effective, and quality learning process takes place. Therefore Students face difficulty in understanding the whole concept."

	Students underperform.	"Students do not understand the concepts fairly when learning takes place online instead of face-to-face."
	No practical skill-based learning.	"I think students are not able to learn properly in an online system thus I do not like online assessments." "Students could underperform due to a poorly theoretical knowledge made an assessment. Also through this system, they do not learn other practical skills related to their course work."
Lost internet connection/ poor network services	Struggle with network.	"Internet connection causing issues during online formative assessment." "Both a student as well as teachers struggle with Internet connectivity issues." "Availability of internet is not possible every time." "Internet connection is sometimes lost."
	Quality Internet obstacles.	
	Insufficient internet availability in rural areas.	"In rural areas there are no or slow internet signal connections, which create a problem for them because they automatically sign out during online assessment session. Subsequently, they require restarting the whole task from zero."
	No/slow internet signals.	"Those students who are using Pakistan Telecommunication Company Limited (PTCL) network for internet face more poor quality internet obstacles than others."
Electricity Issue	Students facing load shedding problem.	"Electricity is not available all the time." "There is no electricity it is difficult to attend class." "No electricity in some remote areas for centuries." "Sometimes the unavailability of electricity is due to load shedding." "Utmost all students were facing problems with electricity."
Noise problem	Disruptive online/home environment.	"Sometime un-favourable noisy home environment creates disruption during online classes, and then it becomes difficult for students to concentrate."
	Students' attention/concentration diverts.	"There is no alternate way or strategy to manage noise when oral online assessments take place, classmates

		forgets answers because of this, and cannot pay sufficient attention to lectures."
Communication gap	Lack of teacher-student interaction. Network disruption. Insufficient peer-to-peer communication.	"Sometimes the communication between the teacher and the student is lost mostly because of the internet." "Online education creates a communication gap between teachers and students; less class interaction happens as compared to offline learning." "Lack of teacher-student and peer-to-peer interaction."
Workload	Huge assignments burden. Multiple presentation preparation.	"Teachers collect too much data for final evaluation in the form of projects, portfolios, and activities." "Too much burden of assignments and presentations to complete for getting good grades."
Cheating	Unauthentic assessment mode. Plagiarised assignments/tests content.	"The online examination system is an unauthentic mode because of online resources e.g. Wikipedia etc. to measure learner's academic performance." "It was that people, who scored average in the physical assessment were able to score way too higher-thanks to the cheating system!" "Students can easily use plagiarism methods to solve the question paper." "First of all when it comes to online exams students do cheat and some students don't so, there should be a way to solute it."
Low quality technical service or products	Poor quality software. Not proper technological setup. Inaccessible authentic online resources/material.	"Most students/teachers face the technical issue because of Poor quality software such as worse camera quality. Unclear sound, disruptive web service, etc." "The most unfavourable aspects of formative online assessment are that students/teachers did not have proper technological setup (such as the latest electronic devices) for taking classes." "We are not much facilitated with the new

	Lacking new technology.	technology." "Authentic material or resources are not easily accessible."
Insufficient Time	Limited time for tasks completion.	"Time period for tests was short, which increase anxiety in a few students because chance of getting fewer marks due to technical errors."
	Time shortage.	"The time limit was made fixed, tutors should be a bit lenient; to see whether students have cheated, not a quick viva always helps."
	Fixed test/viva duration.	"Overly a Time shortage for mailing handwritten papers after task completion." "Shortage of time to complete online assignments and quizzes."
Non-serious students attitude	Lack of concentration/ Attention by students.	"The students did not concentrate on the lessons and were unexpectedly not serious in study." "Several times students do not pay attention to online assessments, which Badly influences their studies."
	Careless learners' behaviour.	"Class fellow do not pay enough attention to lectures even though most of the students do not take classes they sleep during online classes."
	Shortage of attendance.	"Because of laziness, few classmates don't wake up in class timing which shows their careless attitude toward this learning approach."
Unfamiliarity with latest technology (LMS)	Difficult adaptation.	"I think it is difficult to adapt to online learning techniques."
	Lack of computer knowledge.	"Some individuals are from backward areas like The Federally Administered Tribal Areas (FATA) and Baluchistan; they feel discomfort in online assessment because of a lack of computer knowledge and weak academic background."
	Weak academic background.	
	Insufficient online	"Lack of student's awareness regarding online education system tools for example LMS, Team or

	tools awareness.	Zoom creates hurdles in their learning process."
Strict marking	Unfair evaluation. Technical errors decrease marks. No extra grades leniency. Teachers detect marks.	"Teachers do not show leniency and detect marks without any reason in assessment." "Firstly got less/average mark due to a technical error and secondly unfair evaluation was done by teachers."
Exam anxiety	Assessment stress/pressure.	"The most unfavourable characteristic of exams to me is the stress at the time of assessment which arouses anxiety in some students whether it is paper-based or online."
Costly internet packages.	High internet charges. Expensive electronic devices.	"Online learning is litter bit expensive because money spends on internet packages." "Internet charges and new electronic gadgets are expensive."
Lack of teacher interest	Poorly made assessments. Unprepared lectures delivery. Non-observant attitude. High teachers' absentees' rate.	"Teachers don't prepare the students properly; no pupil listens to online lectures that are why some students underperform in quizzes, and also due to poorly made assessments." "In actual some teachers do not aware of what is actually going into the class. Teacher's not attending class on time causes online classes irregularity."
Unfavourable approach	No positive aspect. Non-practical/useful method. Non-supportive assessment way. Prefer on campus learning.	"Everything is unfavourable about the online assessment cannot mention only one." "Please do not switch to online learning as no positive aspects are there." "It's better to take on-campus classes rather than online (e-learning)." "I am totally disagreeing with online assessments." "Formative online assessment is just a drama in some minds and therefore unfavourable." "This method should not be

		practical if it comes to online examinations."
Out-dated teaching style	Follow traditional teaching methodology. Passive learning.	"Teaching methodology/style is not active and engaging for all students." "Teachers after finishing a passive session do not ask every student if they have any doubts/unclear concepts regarding the lecture."

Table 4.20 illustrates the qualitative data of one open-ended survey question by using thematic analysis to find the answer of research RQ3 that is related to identifying challenges experienced by university students throughout formative online assessment at the higher education level. The researcher gathers qualitative data from 50 participants. After assembling the whole data researcher generates codes and from these codes confirmed seventeen themes to answer the research question. Table 4.20 comprises two sections; in the beginning, column writes down theme titles. Transcribe quotations of significant statements given by respondents in the last column. Of these seventeen categories; the 1st one is no productive learning, tutees consider that no effective teaching-learning process occurs through the online education system. 2nd theme has associated with poor network service, participants complain about the loss of internet connection during online lectures.

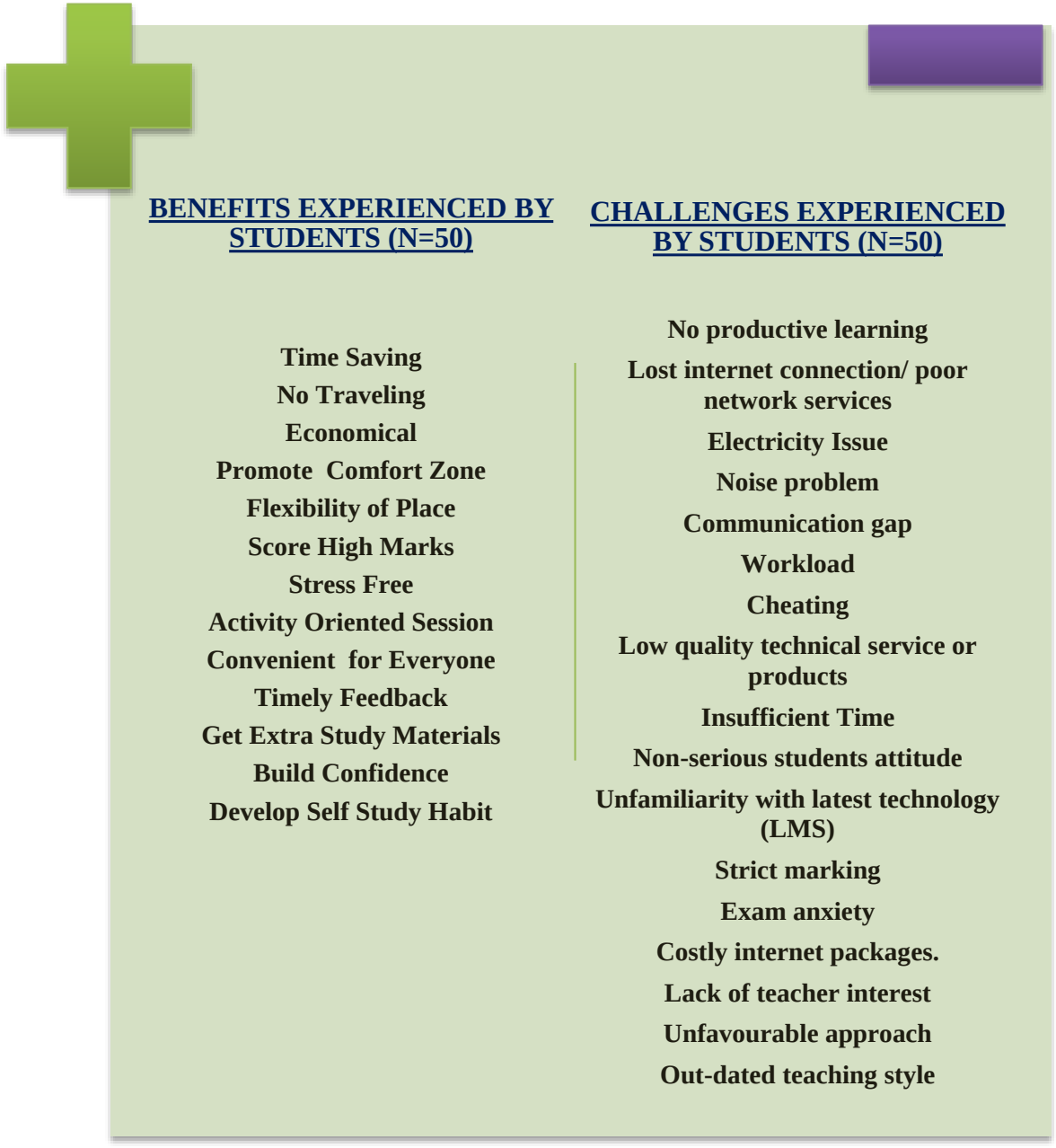
3rd element is the electricity issue; undergraduates are upset with the unavailability of light due to load shedding. 4th component has allied to noise problems; candidates face noise disruption when giving online viva. 5th theme is the communication gap, students mention that less tutor learner or peer-to-peer interaction happens because of the e-learning method. 6th category has based on workload; learners indicate they experience more assignment and project completion for online evaluation. 7th item is cheating; respondents remarked many classmates complete their tasks by using plagiarism

techniques. 8th feature has linked to low-quality technical service, students highlighted both instructor-learner not facilitated with latest technical equipment’s. 9th heading is insufficient time, learners talk over the shortage of time period for quiz preparation and task completion.10th theme belongs to non-serious students' attitude, undergraduate expresses their concern in a such manner some pupils do not pay attention on lectures surprisingly sleep in an online class.

11th category is unfamiliarity with the latest technology, participants think those novices who have weak academic knowledge unaware of how LMS functions. 12th element has related to stick marking; candidates responded that few trainees assumed instructors do unfair evaluations by deducting marks. The 13th component is exam anxiety, learners specify they feel evaluation fear whether it conducts virtual or offline. 14th item has linked with costly internet packages; participants show concern on the high net and electronic devices prices. The 15th theme is the lack of teachers' interest; respondents emphasized, that tutors do not show professionalism in their field and attend classes regularly on time. The 16th element has associated with unfavourable approach, undergraduates expressing their dissatisfaction with the online assessment techniques. Last 17th theme is out-dated teaching style; students indicate passive and non-participated behaviour of learners because of the educator-centered method. Hereafter writing themes analysis, the answer of research RQ3 is yes, the online formative assessment at the higher education level is create some challenges for pupils in relation to resulting themes which are given above in Table 4.20.

Figure 4.2

Brief Overview of Benefits and Challenges Experienced by students N=50



4.4 Part Three: Qualitative Data Analysis of Interview Protocol

Objective 3: To explore the experiences of university teachers regarding environment of formative online assessment at higher education level.

RQ4. What benefits are experienced by university teachers in relation to formative online assessment at higher education level?

RQ5. What challenges are experienced by university teachers in relation to formative online assessment at higher education level?

Table 4.21

Benefits experienced by teachers in relation to formative online assessment at higher education level.

Themes	Sub-Themes	Benefits Experienced by Teachers Description Quotations of Teachers Significant Statements
User-Friendly Approach	Easy tasks handling.	"I think formative online assessment is user-friendly for both students and teachers due to online resources accessibility and material."
	Online resources/ material accessibility.	"I think that online assessment is user-friendly due to various reasons, such as its controllability/handling via several online applications."
	Easy evaluation process.	"It is user-friendly because I am good with computers and use of internet."
	Increase computer/ internet usage skills.	"It is user friendly, there are various ways for it e.g. for discussions using breakout rooms in the zoom, for quizzes using Google Forms, and completing assignments with the help of using numerous mobile apps. Etc. so one gets a variety."
		"It is user-friendly we can easily check the hard work of students online. It also tells us clearly the source of information."
		"It is user-friendly if the respondents have access to internet and apps etc."

Easy Marking	Provide immediate response Generate quick results.	"Assignment marking is easy and students can get the comments immediately." "Easy to mark/assess students' performance and easy in generating quick results."
Record Keeping	Save/transit results. Everyone access data. Store tasks results.	"We keep a record of the assessment activities that we conduct. Moreover, the end user/evaluator can save and transmit the results with a few clicks." "Online save record information for teacher, accessibility to the material and the assessments (Quizzes and assignments)." "It's easy to store assessment results in softcopy as compared to hard copy."
Multiple Assessment Choices. Such As	Online (Google form/Microsoft Teams, Zoom, blackboard). Hand-Written (less copy-paste chances). Emailing (easy, convenient, and feasible).	"I prefer Microsoft Teams and also return the assignments of students on it. It's a good tool I have a lot of options; quizzes and assignments are saved, I can add deadlines for submission, I can experiment with various tools and this is interesting." "If I am given a choice to take an online assessment, I will prefer online apps like Kahoot! And Mentimeter." "Prefer online assessment methods such as Google forms, Google classroom-based assignments, Zoom-based presentations, and blackboard because; it's convenient at both ends." "Prefer handwritten assignments because students can create their own work by visiting a number of resources." "I prefer handwritten assignments because it is easy to check and there are fewer chances of copying (copy and paste process) by a student." "Emailing assignments is a feasible and most convenient method." "Emailing is the method I prefer because in less time I can approach more students and it is easier to use."
Students Got	Online resources Awareness.	"Students benefitted more from online assessment because of awareness of online quizzes, online presentations, online viva,

Facilitate		online discussion, online assignments/project submission, etc."
	Getting high marks.	"Students benefitted more from formative online assessment because their marks are significantly high in online quizzes and online presentations."
	Be creative.	"Students benefitted because they could add videos, visuals, charts, online links, and other additional material to support their work."
	Various alternative communication methods.	"Students are able to Prompt communicate through the chat box, unmuting the audio option and asking difficult points they cannot understand during the session."
Flex-Time	Evaluate/access tasks anytime.	"The teacher/evaluator and student/candidate can access the evaluation results remotely at any time conveniently."
	Online Tools approachable everywhere.	"Online platforms are easily available at any time there is no limitation of working hours etc. we can easily check at any time when we are free on mobile as well."
	Less time consuming.	"It saves you a lot of time and you assess whenever you are free. In less time we can approach more students and it is easier to use."
	Save time.	
	Time efficient.	"According to my point of view, that the impact of online formative assessment is positive. I do not need extra time (time efficient) to check and distribute the results to students."
Workplace flexibility	No workplace constraint.	"Most students like online assessment because they can do it from anywhere, like at home, café, traveling, etc."
	Work from anyplace.	"Physical presence of students/teachers is not required. It has impacted my own performance in terms of easily doing it whenever and wherever I want."
Evaluate Teaching Style	Teaching methods analysis.	"The helpful aspect which I think is that the students learning behaviour can be assessed and it is beneficial for us to alter our teaching style by looking at students learning behaviour."
	Improve instruction plan.	
Convenient	Easy tutorial-	"There are convenient software programs (Search engines

For Everyone	video software programs. Appropriate/ easily activities management. Understandable data storage /presentation.	available on internet) that are easy to use for both students and teachers." "As per my opinion it positively impacted the way of assessment because instead of printing hard copies and then distributing in face-to-face classes now it is more convenient to prepare an assessment on Google form and distribute it to students via a single link... Moreover, Google forms provide vast data of students' marks, frequencies, and percentages as well as a graphical representation of data through which we can not only assess individual performance but the performance of the whole class and make comparisons easily." "In my opinion, students like this way of convenient assessment because after COVID 19 again beginning of face-to-face classes they request me to use online ways of assessment instead of in class."

Table 4.21 exhibits the qualitative data of structured written interview protocol by means of thematic analysis to find the answer of research RQ4 which is related to exploring benefits experienced by university tutors during the formative online assessment at higher education level. The researcher collected qualitative data from 17 participants. For generalizability in qualitative studies minimum of 15 to 17 individual interviews is enough as stated by Guest et al., 2006. After gathering the interview data researcher creates codes and from these codes finalized twelve themes to answer the research question. Table 4.21 consist of two portions; first column writes down theme headings and last column transcribes quotations of significant statements given by teachers.

Of these twelve themes; the first one is a user-friendly approach, teachers think that online assessment provides them access to various online resources/materials. The second category is easy marking, instructors’ replied in support of this theme and said it is

easy to mark students' performance and generate quick results. Third heading is record keeping; tutors said yes this approach is helpful in storing learners' results. The fourth, fifth, sixth, and seventh theme has related to multiple assessment choices, educators support this element such as some favour online platforms, few prefer hand-written, and the majority choose to email when conducting assessments. The eight elements have been associated with students getting facilitated in the following terms just like; teachers agree that pupils got high marks, aware of online assessment methods, made an effective presentation, and asked questions both in written/oral mode.

The ninth item is flex-time, and the tenth component is workplace flexibility; instructors highlight that they can do their work tasks anytime from anywhere. The eleventh theme is evaluating teaching style, one lecturer indicates by observing student learning behaviour we are able to assess our instruction method. The twelfth category has linked with convenience for everyone, professors think they conveniently prepare tests and assess learner knowledge, also easy to use for both students and teachers. Hence after reporting themes analysis, the answer of research RQ4 is yes, the online formative assessment at the higher education level is beneficial for educators in terms of the following themes which are given above in Table 4.21.

Table 4.22

Challenges experienced by teachers in relation to formative online assessment at higher education level.

Themes	**Sub-Themes**	**Challenges Experienced by Teachers** **Description** **Quotations of Teachers Significant Statements**
No Training	No tech-staff support.	"No technical support from department of information technology (IT) for training students, staff, and faculty to

		use these assessment tools."
	No technology literacy programs.	"No training was provided to newly inducted teachers or teachers that are not well aware of the technology used for better online assessment results."
No Technical Support	Inadequate LMS.	"Learning management systems or computer management systems were not widely used."
	Constrained online resources usage.	"No access to and availability of technical gadgets/apps which provide a much more secure platform whenever audience use."
	Interactive online tools deficit.	"We do not have new interactive tools that offer enhanced features without payment."
		"Not incorporating new mobile apps to make formative online assessments more users friendly."
Internet Dis-Connectivity	Unreliable internet connection.	"During online quizzes disconnection problem."
		"The non-availability of internet is an issue for most of the students."
	Network non-availability.	"Proper Internet connectivity is one of the challenging aspects of online platforms."
		"Sometimes to access the assessment questions, users required a specific browser but they face an unreliable internet connection."
Electricity issue	Load shedding.	"Sometimes electrical/lighting issues cause hurdles in this type of assessment."
		"Primarily non-availability of light services poorly impacted online assessment."
Cheating	Copy-paste tests content.	"Students can take more benefits during online sessions they can cheat and can use other ways to get marks."
	Plagiarized assignments.	"Students who do a lot of cut copy paste indulge in plagiarism."
		"Online assessment has a disadvantage because you never know whether the student has relied on his own knowledge gained through my teaching or he/she had to get help in the

		form of Google search or other friends etc."
Non-Serious Students Behaviour	Lack of concentration.	"Student response rate was low in a group discussion because of their lack of concentration."
	Students' engagement rate declines.	"Lack of face-to-face communication tends to ease some students because somehow they do not take it seriously and their engagement during session declines."
		"Students do not take online assignments seriously because they do not have to face teachers with results."
	Learners' dishonesty during tests.	"For online formative assessment there is no seriousness and honesty on the part of students and evaluator then how it brings fruitful results."
		"If we are talking about which methods students take seriously, then I think the answer is face-to-face communication."
Lengthy Procedure	Burden of workload.	"It takes time to complete all these procedures from giving online tasks and providing instructions on how to do them then waiting for students' mailing."
		"It is a burden; you have to give more time to the student for him/her to understand the app or the technique he/she will be using to complete assessment."
Struggling To Adapt	Impact marking style.	"It is not very useful for traditional teachers. For them first availability and switching from traditional mode to online bit hard."
	Shift to online mode difficult.	"It has impacted marking as one tends to become more cautious and efficient."
Inauthentic	Tasks/tests credibility effects.	"Excessive numbers of virtual videos/blogs/sites make it quite difficult to find good content for assessment."
	Students' passive involvement.	"No inquisitive learning approach takes place to make online assessments student-centric/oriented."
		"The credibility of assessment is in question due to Inauthenticity and invalidity of the online exams or tests."

Disapprove Online Assessment	Dissatisfactory online assessment.	"Students benefitted more from face-to-face assessment than online because many things can be discussed in detail and it enhances confidence as well."
	Communication gap.	"For teaching online mode is suitable but for assessment online mode is not appropriate."
	Ineffective students learning.	"Face to face is liked by other instructors as well as my students instead of online mode because we are tuned to it and communication is done in a better way."
		"Face-to-face assessment is the most effective way to assess students learning; as well I do not think formative online assessment has benefitted my students."

Table 4.22 determines the qualitative data of structured written interview protocol by using thematic analysis to find the answer of research RQ5 that is related to identifying challenges experienced by university tutors during the formative online assessment at the higher education level. The researcher gathers qualitative data from 17 participants. After assembling the whole data researcher generates codes and from these codes confirmed ten themes to answer the research question. Table 4.22 comprise two sections; the first column writes down theme titles and transcribes quotations of significant statements given by respondents in the last column. Of these ten categories; the 1st one is no training, instructors consider that no training is provided by the university IT department to both pupils and new teachers.

2nd theme has associated with no technical support, educators highlighted that both instructor-learner are not facilitated with the latest technical gadgets. 3rd element is internet dis-connectivity, participants complain about the loss of internet connection during online lectures/assessments. 4th component has connected to the electricity issue; professors are upset with the unavailability of light due to load shedding. 5th category is

cheating; teachers remarked many learners complete their tasks by using plagiarism (copy/paste) techniques. 6th feature has been linked to non-serious students' behaviour, professors express their concern in such a manner, students do not take online evaluations seriously and their engagement during sessions declines.

7th heading is a lengthy procedure, instructors think from assigning tasks, giving guidelines/instructions, and then waiting for tutees' emails is a very time taking process. 8th theme has allied with struggling to adapt, educators responded that those teachers who follow traditional evaluation methods face difficulty in switching to online mode. 9th category is inauthentic, lecturers show concern due to online exams the credibility of assessment is in question for everyone. 10th component belongs to disapprove online assessment, tutors expressed their dissatisfaction with the online assessment technique and prefer face-to-face evaluation mode. Henceforward writing themes analysis, the answer of research RQ5 is yes, the online formative assessment at the higher education level is create some challenges for evaluators in relation to resulting themes which are given above in Table 4.22.

Figure 4.3

Brief Overview of Benefits and Challenges Experienced by teachers N=17

CHAPTER 5

SUMMARY, FINDINGS, DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

Formative online assessment refers to the on-going testing procedure for learning, utilizing Information Communication Technology (ICT) platforms during the teaching-learning process at the higher education level, such as online tests/quizzes, viva, online discussion, online presentations, and assignments, etc. The study aims to analyze the environment of formative online assessment at the higher education level. The objectives of the study were to compare demographic variables (gender, sector, residential area) and explore the experiences of students and teachers during formative online assessment at the higher education level. The researcher applied an adapted Supportive Online Assessment Environment theoretical framework and used a concurrent triangulation mixed method design that employed both quantitative and qualitative approaches to make the results more authentic. The population of this study was six universities of Islamabad Capital Territory that offered common programs/departments of Social Sciences at the Undergraduate Level. A stratified random sampling technique was used to collect data from 370 students through a survey questionnaire. A convenient sampling technique was used to collect data from 17 teachers through an interview protocol. The adapted survey questionnaire, with both open and closed-ended questions, consisted of five sections, and the structured written interview protocol contained seven questions. The analysis of quantitative data was done through descriptive statistics (frequencies/percentages) and inferential statistics (independent sample t-test, one-way ANOVA). The analysis of

qualitative data was done by thematic analysis. In this fifth chapter, the researcher has written a brief summary, final findings, discussion, conclusion, and recommendations of the research study. In the next heading, the researcher will discuss in detail all the results of the research questions and hypotheses, one by one.

5.2 Findings

The final result shows that 209 (56.37%) respondents considered the overall environment to be inefficacious, while 161 (43.63%) students experienced it as efficacious during online formative assessment. Therefore, after analysing complete descriptive statistics data, the researcher infers that the answer to research question one (RQ1) and research objective one is that the overall environment of formative online assessment at the higher education level is inefficacious for students in all three terms of setting, whether it's virtual, intellectual, or emotional (Table 4.2). The researcher explains each category's results in detail below.

The researcher has determined that the answer to research question RQ1 (a) is that there is an inefficacious virtual environment throughout online formative assessment at the higher education level for students. This is because the virtual setting is considered 55.1% inefficacious in numerous factors due to low percentages by students, such as online assessment design (class size), technological setup, quality facilitation of LMS, technical support and training, online teacher reachability, electricity availability, network/Wi-Fi accessibility, and a distraction-free (noise-free) environment. However, this environment shows 44.9% efficaciousness in some sectors by receiving high percentages, such as for online tutorials, online material (PDF files, PPT, A-V aids), own devices, user-friendly assessment (mobile), time efficiency, and efficiency in money (Table 4.3).

222 (60.00%) participants think the overall intellectual environment is inefficacious in the following areas owing to getting low percentages via undergraduates for example in clarity of objectives, practice tutorials, time for preparation, online resources, individual learning styles, teacher audibility, self-assessment, peer-assessment, active involvement, monitor learning, problem-solving based assessment, consistent teaching style, and reliable ICT vice versa. 148 (40%) respondents experienced it as efficacious in few elements by giving high percentages, such as regular reminders to activities (assessment), clear information and instructions, a comfortable assessment culture, questioning method, and feedback. respectively, the researcher concludes that the answer to research question RQ1(b) is that the intellectual environment is inefficacious in the course of an online formative assessment at higher education level for students (Table 4.4).

200 (54%) participants think the overall emotional environment is inefficacious due to getting low percentages among students in numerous items such as positive attitude, no anxiety, emotional support, mentoring by teachers, appreciation, adequate time to complete tasks, and technology adaptation. Conversely, 170 (46%) respondents experienced it as efficacious by giving high percentages in some categories, for instance, following etiquette, learning responsibility, being comfortable, trusting LMS confidentiality policy, confidence, and setting high results expectations. Therefore, the researcher deduces that the answer to research question RQ1(c) is that there is inefficacious emotional environment during an online formative assessment at higher education level for students (Table 4.5).

There are a total of three demographics (sector, gender, and residential area) on the basis of these null hypotheses developed to get results after testing and answer research objective four. The first four hypotheses are related to sector-wise comparison.

Result reveals that researcher rejects null hypothesis Ho1 (a), also private sector universities have been more affected by virtual environment during formative online assessment at a higher education level as compared to public sector universities. Researcher fails to reject null hypothesis Ho1(b), since there is no significant difference between public and private sector universities with respect to intellectual environment of online formative assessment at higher education level. Scholar rejects null hypothesis Ho1(c), additionally, results report that private sector universities have been more affected by emotional environment in the course of formative online assessment at higher education level than public sector universities. Furthermore, null hypothesis (Ho1) is rejected; in addition, outcomes report that private sector institutions are highly affected by overall environment of formative online assessment at higher education level as compared to public sector universities (Tables 4.6, 4.7, 4.8, and 4.9).

In coming up next group, four hypotheses are related to gender-wise comparison. Researcher reject null hypothesis Ho2 (a), moreover, the results show that female students have experienced a greater observed effect of virtual environment during a formative online assessment at higher education level than male students. Scholar fails to reject null hypothesis Ho2 (b) because there is no significant difference in mean caused by intellectual environment of formative online assessment between male and female students at higher education level. The null hypothesis Ho2 (c) is rejected; additionally, results reported indicate that female students have been highly affected due to emotional environment in the course of formative online assessment at higher education level than male students. Lastly, the null hypothesis (Ho2) is rejected; furthermore, the outcome reports that female students are highly affected by overall environment of formative online assessment at higher education level than male students (Tables 4.10, 4.11, 4.12, and 4.13).

In the subsequent third group, four hypotheses are related to residential area-wise comparison. researcher reject null hypothesis Ho3 (a), also those students who belong to different residential areas such as urban, suburban, and rural went through diverse virtual environment during formative online assessment at higher education level, moreover, especially those learners who live in rural areas are highly affected. Scholar fails to reject null hypothesis Ho3 (b) for the reason that there is no significant difference of mean in terms of residential area of students owing to intellectual environment for online formative assessment at higher education level. The null hypothesis Ho3 (c) is rejected; additionally, those students who are living in urban, suburban, and rural residential areas experienced dissimilar emotional environment in the course of formative online assessment at higher education level. Specifically, that student who belongs to rural areas is highly affected. Final null hypothesis (Ho3) is rejected, as well as those students who are situated in different residential areas like urban, suburban, and rural who experienced an overall diverse environment during formative online assessment at higher education level. Particularly, those learners who belong to rural areas are highly affected (Tables 4.14a, 4.14b, 4.15a, 4.15b, 4.16, 4.17a, and 4.17b).

Thematic analysis has been done to answer research questions (RQ2, RQ3) and research objective two that are related to describing what university students' experienced during formative online assessment at higher education level. Findings mentioned that following numbers of benefits experienced by undergraduates are time savings, no traveling, economical, promote comfort zones, flexibility of place, score high marks, stress-free, activity-oriented sessions, convenient for everyone, timely feedback, get extra study materials, built confidence, and developed self-study habit. On the other hand, there are also challenges experienced by learners, which include no productive learning, lost internet connection or poor network services, electricity issues, noise problems,

communication gaps, workload, cheating, low-quality technical services or products, insufficient time, non-serious students attitude, unfamiliarity with latest technology (LMS), strict marking, exam anxiety, costly internet packages, lack of teacher interest, unfavourable approach, and out-dated teaching style (Tables 4.19 and 4.20).

The thematic analysis has been done to find the answer to the research questions (RQ4, RQ5) and research objective three, which is related to exploring benefits experienced by university tutors during the formative online assessment at higher education level. Findings revealed numerous benefits experienced by teachers, that are user-friendly approach, easy marking, record keeping, multiple assessment choices such as online, handwritten, and emailing, students got to facilitate, flex-time, workplace flexibility, evaluate teaching style, and be convenient for everyone. Alternatively, there are also challenges experienced by educators, which are no training, no technical support, internet disconnection, electricity issue, cheating, non-serious students' behaviour, lengthy procedures, struggling to adapt, inauthentic and disapprove online assessment (Tables 4.21 and 4.22).

5.3 Discussion

The discussion of this study has been based on the general findings of research objective one and the outcomes obtained through all three parts of the analysis in chapter four to answer research question one (RQ1) with all three of its parts. The discussion is categorized into two parts: efficaciousness and inefficaciousness elements during online formative assessment at higher education level. Including all inefficacious descriptive results, also both students' and teachers' thematic analysis findings, the challenges are as follows; no technical support (technological set-up) and training provided to learners/teachers, and they also struggling with technology adaptation because few

students/educators are unfamiliar with latest equipment's or software e.g. learning management system, there are large numbers of students during online assessment which affects its quality implications, undergraduates complain that there is communication gap during formative online assessment which caused low involvement rate, no peer-to-peer and self-assessment as well tutors highlighted the cheating issue at the time of e-assessment, simultaneously students faced time management issues in online tasks completion. Due to time constraints, online practice tutorials are also not carried out.

These findings are in line with the outcomes of Beleulmi, (2022) which identified several obstacles to online formative assessment, such as both teachers and students encountered technical problems due to unavailability of productive technological tools, even though they are not trained to use operating systems or software like Moodle, Google Classroom, etc. In fact, educators and learners experienced difficulty adapting to the latest trend while switching from face-to-face classrooms to online classes for e-assessment when there is lack of knowledge or awareness related to computer skills, especially for pupils. Another demerit is that the large number of online class sizes affects its proper management and no focus on all candidates during evaluation. No facilitated communication among teachers and students takes place, neither through ensuing peer and self-assessment methods nor through learners actively engaged in online activity sessions. The major drawback is academic dishonesty in the form of cheating and plagiarism by using different online website content in assignments/projects. The last disadvantage pointed out by the author is time management issues for both instructors and tutees.

Based on research objective two and research question (RQ3), in this study, some other challenges are also detected by the researcher, just like low-quality facilitation of technical service (LMS) and products, internet disconnection, non-serious students

behaviour, workload for both educators and learners, a lack of reliable and authentic assessment, unfavourable approach because there is no productive learning, no monitor learning, and no problem-solving-based assessment. The results of another study, conducted by Al-Maqbali and Raja-Hussain (2022) agreed with these outcomes. The study found that institutions face serious and some moderate hurdles during online assessments which are the poor quality of Information Communication Technology (ICT) infrastructure, particularly the Learning Management System (LMS) has some issues that why its application is not possible in online classrooms, students proficiency in technological area is lacking and even academic staff are unable to handle technical equipment's. The internet/Wi-Fi network is not accessible to everyone. Many students show a non-serious attitude toward online assessment, which also increases their absence rate. The procedure of online assessment instrument formation is lengthy and requires a lot of time from teachers; therefore, they become unexpectedly overloaded with work. Students are also overloaded with high numbers of tasks to complete. The ensuing process of authentication and reliability (integrity) of online assessment is greatly questionable due to impersonation/dishonesty threats, e.g., cheating and plagiarism, because of the large number of students participating in online sittings. It is tough for educators to cover all learning outcomes, especially critical learning-oriented objectives, through online assessment, which makes this approach ineffective.

There are several more disadvantages that were identified through the necessary discussions conducted to achieve the outcome of research objective three and answer research question five (RQ 5). These include the lack of online resource usage, electricity issues, distracting environment, resistance to listening to educator audio, unavailability of online teachers, lack of teacher interest, and non-supportive behaviour leading to inconsistent teaching styles. To support these results, other study outcomes by Noor and

Husnine, (2020) clearly show that during online classes, the main problems are inappropriate e-assessment environment in terms of multiple voice distractions, clear sound issues, inequality related to the obtainability of appliances, and constraints by institutions in using online resources. The biggest issue in Pakistan is load shedding, which causes no signal or slow internet speed and affects teachers' online approachability. Students have low motivation for online sessions as a consequence of out-dated teaching styles. Overall, during the pandemic Students' and their parents' non-serious behaviour along with teachers', also affects the online education system. The last challenge is students' anxiety. Khalid et al., (2021) stated that due to COVID-19 and online education, both instructors and learners faced anxiety, stress, and depression.

Study findings related to research objectives two and three and research questions (RQ2, RQ4) also displayed benefits of online formative assessment that are user-friendly in terms of easy marking, students data record keeping, no traveling, convenience for everyone, multiple assessment choices, students getting facilitated by receiving high marks and extra online study material, being economical, stress-free, building confidence, saving time, promoting a comfort zone, receiving timely feedback, and workplace flexibility. Similar outcomes come from Beleulmi, (2022) study such as the merits of online assessment are that Google Classroom is more convenient, comfortable, easier, and simpler to use than Moodle for both instructors and learners. In one place, educators are able to create classes, assign tasks, mark them, and send feedback. It is easy to track and record students' performance and deliver effective, immediate feedback on tasks. Tutors agree that online assessment is efficient in time and effort as compared to paper-based testing.

Peytcheva-Forsyth (2017) mentioned various advantages/benefits of online assessment, for example its lower cost compared to traditional exams, provides

immediate response to students, is fully automated in the marking and evaluation process, takes place at any time/anywhere, has a versatility of tools that can be used for online assessment, and all types of evaluation are able to be conducted online, whether formative, summative, placement, or diagnostic. It is providing lifelong learning opportunities, access to geographically constrained areas, and also to those disabled students who are unable to reach educational institutions. Have replicable abilities and offer suitable data management sources.

Baleni, (2015) highlighted that the advantages of formative online assessment are numerous. For instance, everyone at home in a relaxed environment can perform this without any stress or external pressure. Students can easily access tasks from anywhere, effortlessly building focus on the organization of time for their completion and then submission. This approach enhances or nurtures learner commitment and confidence to get fruitful learning experiences with fast-track feedback provision, develop flexibility in the matter of time and place while doing assessment tasks. Instructors also benefited because it saved on administrative costs and required them to spend less time on marking. The significant features of online formative assessment setting are offering interactive feedback and developing such on-going trustworthy testing tasks that deal with intimidations caused to rationality and trustworthiness. In the current study, one benefit is trust in the university's confidentiality policy. However, Al-Maqbali and Raja-Hussain (2022) found that students refused to open their cameras during online classes due to trust issues in online privacy policies and cultural restrictions.

Results of research objective four inferential statistics in this study indicate that the private sector universities' overall environment in terms of virtual and emotional setting during formative online assessment at higher education level is more affected than that of the public sector universities. Based on hypothesis (H_O1), the study also reveals

that intellectual environment affects both sectors' institutions equally. On the other hand, Ullah et al., (2011) study shows mixed thoughts or outcomes; it is found that private universities lag behind in equipped libraries, research facilities, and trained academic staff or faculty members, whereas public sector universities are lacking in multi-media use and equipped laboratories. Four gender related hypotheses (H_O2) results indicate that female students are more affected by the overall environment in virtual and emotional settings during online formative assessment at higher education than male students. The study also tells that intellectual environment affects both genders equally. Similar results are reported by Kamran et al., (2022) Girls have a large number of domestic responsibilities; they are less likely to have their own mobiles with internet access, the greatest barrier for them in remote learning or assessment is digital access. Also, cultural norms or rules delimited females' entrance to technological world more than male candidates.

Four residential area related hypotheses (H_O3) outcomes indicated that the rural area candidates are more affected due to the virtual, emotional, and overall environment during online formative assessment at higher education level than urban and suburban areas students. The study also states that intellectual environment affects all residential areas equally. Likewise, Zahra et al., (2020) found that the coronavirus knocked down education for those pupils who belong to rural areas, and even the higher education commission played an incompatible role in terms of providing them essential online learning facilities.

5.4 Conclusion

The research objective one is based on analysing the environment of formative online assessment. The overall result shows that the total environment of online formative assessment at higher education level is inefficacious in terms of virtual, emotional, and

intellectual settings. Students considered that there is inefficacious technological set-up, online class size, and teacher accessibility in virtual environment. Additionally, learners think of it as inefficacious intellectual environment in the following aspects: clarity of objectives, practice tutorials, online resources, individual learning styles, self-assessment, peer assessment, active involvement, monitor learning, problem-solving-based assessment, and reliable ICT. Furthermore, undergraduates also deliberated that inefficacious emotional support, appreciation, and mentoring are provided by teachers.

Based on research objective four, twelve null hypotheses related to sector, gender, and residential area are tested, and the outcomes indicated that private sector universities, female students, and rural area candidates are more affected by the virtual, emotional, and overall environment during online formative assessment at the higher education level than public sector universities, male students, and urban and suburban area students. The study also revealed that the intellectual environment affected sectors' (private and public) institutions, genders, and all residential areas equally.

The answer related to research objective two is as follows: University students experienced a number of benefits during formative online assessment at the higher education level, which included not having to travel, being economical, promoting their comfort zone, scoring high marks, being stress-free, having activity-oriented sessions, receiving timely feedback, getting extra study materials, building confidence, and developing self-study habits. In addition to this, some challenges are encountered by learners, such as noise problems, communication gaps, insufficient time, strict marking, exam anxiety, costly internet packages, a lack of teacher interest, and out-dated teaching styles.

The response to research objective three is as follows: The benefits experienced by university teachers during formative online assessment at the higher education level

are a user-friendly approach, easy marking, record-keeping, multiple assessment choices, time-saving, workplace flexibility, evaluating their teaching style, and convenience for everyone. However, there are also challenges experienced by educators, which include a lack of training, no technical support, internet disconnection, electricity issues, cheating, non-serious student behaviour, lengthy procedures, struggle to adapt, inauthenticity, and lastly, disapproval of online assessment.

5.5 Recommendations

1. Universities may offer proper technical training seminars, workshops, or classes to students and teachers for awareness and skill formation before planning or moving to online assessment. In this way, learners and educators will become familiar with new technological techniques or online applications, such as Kahoot, Mentimeter, Socrative, Quizizz, Nearpod, Seesaw, Quizlet, and many more.
2. Both sectors of universities may need to enhance their all-online platforms by implementing a properly functional Learning Management System (LMS) and Information Communication Technology (ICT) system. This will provide students and teachers access to a vast range of virtual academic facilities and resources.
3. For those learners living in faraway areas (e.g., rural or hilly regions) or underprivileged communities in all parts of Pakistan, especially female students, the government, HEC, and universities may provide them with access to quality laptops or tablets. They may ensure the provision of affordable cellular technology or introduce data-friendly packages for students. Additionally, better internet connectivity and network coverage may be provided at hostels to improve access to online learning and assessments. Moreover, the learners may be given knowledge on how to stay safe online.

4. Universities may need to address the problem of cheating, which can include plagiarism and impersonation. To this end, Transient Electronic System Level Analysis (TESLA) may be employed. TESLA focuses on utilizing face and voice recognition, keystroke analysis, and anti-plagiarism techniques to detect and prevent academic dishonesty in all its forms. The approach may also involve implementing biometric systems, timestamps, digital signatures, written analysis, monitor programs, and automated plagiarism checking software for added effectiveness.
5. Higher educational institutions may establish University Management Committees (UMCs) as a platform where diverse stakeholders, including university administrative members, teachers, academic staff, educational professionals, students, parents, government officials, technology providers, telecom network operators, and communities, can coordinate and discuss comprehensive and effective methods for virtual learning and assessments. These committees may arrange interactive forums where they can work together to improve online education. Specifically, for improving teacher-student interactions, high-quality educational technology and mobile applications may be utilized to overcome communication gaps between them.
6. Universities may explore alternative strategies that can replace online assessments due to authenticity issues. First, they may adopt appropriate online assessment practices. In addition, universities may arrange for in-person testing centres under the responsibility of university management committees. Instead of relying solely on objective or subjective tests, universities may assign practical-oriented field projects to learners to develop their learning interests and enthusiasm.

Table 5.1

Research Objectives, Statistical Analysis, Conclusions and Recommendations

Research Objectives	Statistical Analysis	Conclusions	Recommendations
To analyse the environment of formative online assessment at higher education level.	Descriptive Statistics Analysis (Frequency/ Pct. or %)	The research objective one is based on analysing the environment of formative online assessment. The overall result shows that the total environment of online formative assessment at higher education level is inefficacious in terms of virtual, emotional, and intellectual settings. Students considered that there is inefficacious technological set-up, online class size, and teacher accessibility in virtual environment. Additionally, learners think of it as inefficacious intellectual environment in the following aspects: clarity of objectives, practice tutorials, online resources, individual learning styles, self-assessment, peer assessment, active involvement, monitor learning, problem-solving-based assessment, and reliable ICT. Furthermore, undergraduates also deliberated that inefficacious emotional support, appreciation, and mentoring are provided by teachers.	Both sectors of universities may need to enhance their all-online platforms by implementing a properly functional Learning Management System (LMS) and Information Communication Technology (ICT) system. This will provide students and teachers access to a vast range of virtual academic facilities and resources.
To explore the experiences of university students regarding environment of formative online	Thematic Analysis	The answer related to research objective two is as follows: University students experienced a number of benefits during formative online assessment at the higher education level, which included not having to travel, being economical, promoting their comfort zone, scoring high marks, being stress-free, having activity-oriented sessions, receiving timely feedback,	Universities may offer proper technical training seminars, workshops, or classes to students and teachers for awareness and skill formation before planning or moving to online assessment. In this way, learners and educators will

assessment at higher education level.		getting extra study materials, building confidence, and developing self-study habits. In addition to this, some challenges are encountered by learners, such as noise problems, communication gaps, insufficient time, strict marking, exam anxiety, costly internet packages, a lack of teacher interest, and out-dated teaching styles.	become familiar with new technological techniques or online applications, such as Kahoot, Mentimeter, Socrative, Quizizz, Nearpod, Seesaw, Quizlet, and many more.
To explore the experiences of university teachers regarding environment of formative online assessment at higher education level.	Thematic Analysis	The response to research objective three is as follows: The benefits experienced by university teachers during formative online assessment at the higher education level are a user-friendly approach, easy marking, record-keeping, multiple assessment choices, time-saving, workplace flexibility, evaluating their teaching style, and convenience for everyone. However, there are also challenges experienced by educators, which include a lack of training, no technical support, internet disconnection, electricity issues, cheating, non-serious student behaviour, lengthy procedures, struggle to adapt, inauthenticity, and lastly, disapproval of online assessment.	Universities may need to address the problem of cheating, which can include plagiarism and impersonation. To this end, Transient Electronic System Level Analysis (TESLA) may be employed. TESLA focuses on utilizing face and voice recognition, keystroke analysis, and anti-plagiarism techniques to detect and prevent academic dishonesty in all its forms. The approach may also involve implementing biometric systems, timestamps, digital signatures, written analysis, monitor programs, and automated plagiarism checking software for added effectiveness.
To compare the experiences of students regarding	Inferential Statistics Analysis (Independent Sample T-	Based on research objective four, twelve null hypotheses related to sector, gender, and residential area are tested, and the outcomes indicated that private sector universities, female students, and rural area	For those learners living in faraway areas (e.g., rural or hilly regions) or underprivileged communities in all parts of Pakistan,

formative online assessment on the basis of different demographic variables (sector, gender, and residential area).	Test, One-Way ANOVA, Bonferroni Post Hoc Correction Test.	candidates are more affected by the virtual, emotional, and overall environment during online formative assessment at the higher education level than public sector universities, male students, and urban and suburban area students. The study also revealed that the intellectual environment affected sectors' (private and public) institutions, genders, and all residential areas equally.	especially female students, the government, HEC, and universities may provide them with access to quality laptops or tablets. They may ensure the provision of affordable cellular technology or introduce data-friendly packages for students. Additionally, better internet connectivity and network coverage may be provided at hostels to improve access to online learning and assessments. Moreover, the learners may be given knowledge on how to stay safe online.

5.6 Recommendations for Future Research

1. This study has been conducted on students and teachers at the university level; future research may be conducted on the students or teachers at the colleges or schools level.
2. This study is based on a mixed method approach; in future researchers may use either qualitative or quantitative method/approach only, for data collection.
3. In this study the target area is Islamabad Capital Territory; future researchers may execute the research study on different areas or even other provinces of Pakistan.

4. Future researchers may conduct research with a large sample size of teachers and students; also they include maximum universities in data collection process.
5. In future the researcher may be conducted research on other stakeholders e.g. parents, institutions administration staff, high authorities' representatives (HEC), and even in government educational representatives, etc.

5.7 Limitations of the Study

Due to universities' security restrictions, also lack of teachers'/ students' interest and cooperation created obstacles in the process of data collection.

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APPENDIX A

NATIONAL UNIVERSITY OF MODERN LANGUAGES
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF EDUCATION

ML.1-4/2021/Edu

Dated: 10th December 2021

To: Bushra Ameer
03MPhil/Edu/S20

Subject: APPROVAL OF MPHIL THESIS TITLE AND SUPERVISOR

1. Reference to Letter No, ML.1-4/2021-Edu, dated 11-12-2021, the Competent Authority has approved the title and supervisor in 12th BASR meeting dtd 18th November 2021 on the recommendations of Faculty Board of Studies vide its meeting held on 9th September 2021.

a. Supervisor's Name & Designation
Dr Marium Din (Supervisor)
Assistant Professor
Department of Education, NUML, Islamabad.

b. Thesis Title

Formative Online Assessment at Higher Education Level: A Mixed Method Approach

2. You may carry out research on the given topic under the guidance of your supervisor and submit the thesis for further evaluation within the stipulated time. It is to inform you that your thesis should be submit within described period **by 31st December 2022** positively for further necessary action please. ***(Time line attached)***

3. As per policy of NUML, all MPhil/PhD thesis are to be run on Turnitin by QEC, NUML before being sent for evaluation. The university shall not take any responsibility for high similarity resulting due to thesis run from own sources.

4. Thesis is to be prepared strictly on NUML's format that can be taken from (Dr Saira Nudrat, Coordinator MPhil/PhD)

Telephone No: 051-9265100-110 Ext: 2094
E-mail: snudrat@numl.edu.pk

Dr. Wajeeha Shahid
Head
Department of Education

Distribution:

Bushra Ameer (MPhil Scholar)

Dr Marium Din (Thesis Supervisor)

APPENDIX B

Table

Listed here are the names of six universities for the collection of sample data.

Sr.no	Sector	University Name	Official Websites Links
1	Public	International Islamic University Islamabad.	https://www.iiu.edu.pk/
2	public	National University of Modern Languages, Islamabad.	https://www.numl.edu.pk/
3	public	Quaid-I-Azam University Islamabad.	https://qau.edu.pk/
4	Private	Riphah International University Islamabad.	https://www.riphah.edu.pk/
5	Private	Iqra University Islamabad Campus.	https://iuisl.iqra.edu.pk/
6	Private	Muslim Youth University, Islamabad.	https://myu.edu.pk/

APPENDIX C

Serial No: _____

Formative Online Assessment at Higher Education Level: A Mixed Method Approach.

Questionnaire for Student

Supportive Online Assessment Environment Questionnaire (SOAEQ)

Dear Respondent,

I am M. Phil scholar (Education) working on Thesis. Title: "Formative Online Assessment at Higher Education Level: A Mixed Method Approach". You are requested to fill the questionnaire. The first section of questionnaire consists of demographic information. Second section of questionnaire deals with virtual environment, third part of this questionnaire deals with the intellectual environment and fourth one with emotional environment during online formative assessment. Remaining open ended questions are related to students experience regarding online assessment.

It is assured that your responses will be kept confidential. Please do not leave any statement unattempt.

Bushra Ameer
Department of Education
National University of Modern Languages,
Islamabad, Pakistan

Demographic Information

University Name:		
Sector ☐ Public ☐ Private	**Gender** ☐ Male ☐ Female	**Your Residential Area** ☐ Urban ☐ Suburban ☐ Rural
Department ☐ Psychology ☐ International Relation (IR) ☐ Mass Communication ☐ Economics		

You are requested to give your responses against the options ranging from 1 to 4 indicating your preferences of responses (SDA: Strongly Disagree = 1, DA: Disagree = 2, A: Agree = 3, SA: Strongly Agree = 4).

	Section 1: Virtual Environment During Online Formative Assessment Suitable ICT material or online platform availability for handling of formative online assessment				
S.NO	**STATEMNET**	**SDA**	**DA**	**A**	**SA**
1.	The class/group size is appropriate for taking online assessment.	1	2	3	4
2.	All technological setup (computer, microphone, ICT platform) available to teachers by university for online assessment handling/ regulating.	1	2	3	4
3.	Quality facilitation (of Learning Management System) is available to students for giving online assessment.	1	2	3	4
4.	The online tutorials (e.g. about learn use of Google Meet or Microsoft Team or Zoom etc.) are helpful for giving online assessment.	1	2	3	4
5.	The technical training programs (e.g. learn to access and manage Learning Management System tool files/folders etc.) are helpful for giving online assessment.	1	2	3	4
6.	Teachers are easily accessible.	1	2	3	4
7.	The materials (PDF/Word files, Power Point Slides, Audio-Visual clips) provided by teachers help make online assessment clear.	1	2	3	4
8.	I am equipped with essential devices (tablets, laptop, and headphones) for giving online assessment.	1	2	3	4
9.	Electricity most of the time/normally available in my residential area.	1	2	3	4
10.	Proper internet is access/available off-campus.	1	2	3	4
11.	Noise free environment is available during online assessment.	1	2	3	4
12.	Online assessment is user friendly (in terms of accessibility to everyone, also able to give on mobile etc.)	1	2	3	4
13.	Online assessments are more efficient in terms of time.	1	2	3	4
14.	Online assessments are more efficient in terms of money.	1	2	3	4
	Section 2: Intellectual Environment During Online Formative Assessment All the things that build students cognition/intelligence during formative online assessment				
S.NO	**STATEMENT**	**SDA**	**DA**	**A**	**SA**
1.	Teachers provide clarity about online assessment objectives.	1	2	3	4
2.	Teachers arrange practice tutorials before final formative online assessment.	1	2	3	4

3.	Teachers remind regarding assessment activities to students on regular basis.	1	2	3	4
4.	Teachers give necessary information /instructions regarding online assessment well in time.	1	2	3	4
5.	Teachers give proper time to students for online assessment preparation.	1	2	3	4
6.	Teachers use different online resources (electronic sources, web sources and Internet sources) well for online assessment.	1	2	3	4
7.	Teachers give assessment to students according to their individual learning style.	1	2	3	4
8.	Teachers create a comfortable assessment culture during online assessment.	1	2	3	4
9.	Teachers communicate clearly or audible during online assessment.	1	2	3	4
10.	Teachers use questioning method as online assessment technique.	1	2	3	4
11.	Teachers engage students in self-assessment during online lectures.	1	2	3	4
12.	Teachers provide opportunities to students for peer-assessment during online lectures.	1	2	3	4
13.	Teachers ensure the active involvement of all students in oral online assessment.	1	2	3	4
14.	Teachers monitor students learning in formative online assessment.	1	2	3	4
15.	Teachers provide timely feedback to students after formative online assessment.	1	2	3	4
16.	Online assessment offers more opportunities (e.g. problem solving) than paper base assessment alone.	1	2	3	4
17.	Online assessment is consistent with the teaching styles.	1	2	3	4
18.	Technology used in online assessments is reliable.	1	2	3	4
	Section 3: Emotional Environment During Online Formative Assessment Entire feeling/sentiments students gone through during formative online assessment setting				
S.NO	**STATEMNET**	**SDA**	**DA**	**A**	**SA**
1.	I follow online basic etiquette (Netiquette).	1	2	3	4
2.	I take all my learning responsibility for online assessment.	1	2	3	4
3.	I have a positive attitude towards online assessment.	1	2	3	4
4.	I don’t feel any anxiety when giving online assessment.	1	2	3	4
5.	I feel more comfortable during online assessment than a paper based one.	1	2	3	4

6.	I fully trust online (LMS) confidentiality policy system.	1	2	3	4
7.	I am adapted to technology used for online assessment.	1	2	3	4
8.	I am satisfied with the emotional support provided by university/department regarding online assessment.	1	2	3	4
9.	I am satisfied with the accessibility and availability of teacher (as mentor) to solve any issues during online assessment.	1	2	3	4
10.	I complete my online assessment with full confidence.	1	2	3	4
11.	I set the high expectations from online assessment result.	1	2	3	4
12.	I receive appreciation for good performance in online assessment.	1	2	3	4
13.	Time given to complete online assessment is adequate.	1	2	3	4

Q1:	What are the most favorable aspects of formative online assessment?
Q2:	What are the most unfavorable aspects of formative online assessment?
Q3:	What suggestions do you have for improving formative online assessment?

THANK YOU FOR YOUR PARTICIPATION!

APPENDIX D

Sr.no	**Structure Written Interview Protocol Form (SWIPF) for Teachers** Form Completion Duration: 10 to 15 minutes
Q1	Do you think formative online assessment is user-friendly? How? (Prompts: due to accessibility, various mobile Apps for its handling, online resources/material etc.)
Q2	Which method of online assessment (emailing, online, Blackboard (mobile app) or hand-written assessment) you prefer? Please provide reasons.
Q3	What are beneficial aspects you came across while utilizing online platform for assessment?
Q4	What are challenging aspects you came across while utilizing online platform for assessment?

Q5	Do you think that formative online assessment has impacted the way you mark and assess students' performance? How?
Q6	Do you think that your students benefitted more from formative online assessment than face to face assessment? Why? (Prompts: online quizzes, online presentation, online viva, online discussion, assignments etc.)
Q7	Do you have any suggestions to make formative online assessment more user-friendly?

APPENDIX E

CERTIFICATE FOR TOOL VALIDATION

CERTIFICATE OF VALIDITY

FORMATIVE ONLINE ASSESSMENT AT HIGHER EDUCATION LEVEL: A MIXED METHOD APPROACH.

By: Bushra Ameer

Supervised By: Dr.Marium Din

M.Phil. Scholar, Education Department, National University of Modern Languages, H-9, Islamabad, Pakistan

This is to certify that the standardized research instruments "**Supportive Online Assessment Environment Questionnaire**" and "**Semi-Structure Interview Protocol**" to be used by the researcher towards her thesis have been assessed by me and I find that the instruments have been designed adequately.

It is considered that the research instruments, developed for the above titled research are according to the objectives, research questions and hypotheses of the research. It assures adequate construct and content validity according to the purpose of research and can be used for data collection by the researcher with fair amount of confidence.

Name: Dr Khurram Shahzad

Designation: Assistant professor

Institution: NUML

Stamp/Signature:

Date: 10/3/22

Best of luck

APPENDIX F

CERTIFICATE FOR TOOL VALIDATION

CERTIFICATE OF VALIDITY

FORMATIVE ONLINE ASSESSMENT AT HIGHER EDUCATION LEVEL: A MIXED METHOD APPROACH.

By: Bushra Ameer

Supervised By: Dr.Marium Din

M.Phil. Scholar, Education Department, National University of Modern Languages, H-9, Islamabad, Pakistan

This is to certify that the standardized research instruments "**Supportive Online Assessment Environment Questionnaire**" and "**Semi-Structure Interview Protocol**" to be used by the researcher towards her thesis have been assessed by me and I find that the instruments have been designed adequately.

It is considered that the research instruments, developed for the above titled research are according to the objectives, research questions and hypotheses of the research. It assures adequate construct and content validity according to the purpose of research and can be used for data collection by the researcher with fair amount of confidence.

Name: Dr. Farhana Khurshid

Designation: Assistant Professor

Institution: Fatima Jinnah Women University

Stamp/Signature:

Date: 24/2/2022

APPENDIX G

Certificate of Proof Reading

PROOF READING CERTIFICATE

FORMATIVE ONLINE ASSESSMENT AT THE HIGHER EDUCATION LEVEL: A MIXED METHOD APPROACH

By

Ms. BUSHRA AMEER

National University of Modern Languages, Islamabad

It is certified that the research work titled "Formative Online Assessment at the Higher Education Level: A Mixed Method Approach" submitted by MPhil Scholar Bushra Ameer, has been thoroughly checked and proofread for language and grammatical mistakes. I have demonstrated a high level of skill and expertise in proofreading, providing valuable services to the author of this thesis.

Name: Tatoori Tafuri

Designation: Lecturer in English

Institute: Govt. Inter College Gupis

Signature: J Jafri.

Date: 13 February, 2023

APPENDIX H

National University of Modern Languages
Quality Enhancement Cell
Sector H-9, P.O. Shaigan, Islamabad, Pakistan
Tel: +92-51-9265100 Ext 2246/2247
Web: www.numl.edu.pk

Dated: December 09, 2022

Faculty of Social Sciences

Subject: Turnitin Report of MPhil Thesis of Ms Bushra Ameer (Educational Sciences)

1st - Attempt

This is to state that **MPhil** thesis of **Ms Bushra Ameer** has been run through **Turnitin Software on December 09, 2022**. Paper ID is 1976086381 and similarity index is 05%. This is within the limit prescribed by the Higher Education Commission.

The subject similarity index report is attached for further processing, please.

(Dr. Khushbakht Hina)
Director
Quality Enhancement Cell

653
FSS

Dean/FSS

13/12/2022.

HOD: Educational Sciences

20/12/22