Leveraging Technology Platform for Timely Conducting Online University-Level Examinations Amid COVID-19 Pandemic: An Experiential Narrative by Engineering Faculty From Western India

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ABSTRACT

India declared nationwide lock-down on March 24, 2020. The time was crucial for academic institutions usually bustling with semester-end examinations. This paper is an attempt by engineering faculty members to share their experience with the process of online examination amid the pandemic. The primary aim is to facilitate process documentation for the benefit of academic institutions in the developing world. It describes authors' personal experiences, observations, as well as perceptions narrated by their colleagues and students during the overall process from orientation to conduction of online examinations. The results report the processes followed, implementation challenges perceived, faced and tackled for conducting online examinations, during the pandemic, under the sub-headings – planning for online exams, training of teachers and students, conduct of online exams, and implementation challenges and solutions. It is anticipated that this documentation will provide insights, to academic institutions in similar settings, about the processes, challenges and brainstorming ideas to overcome anticipated challenges within given resources and other constraints.

Keywords: Online learning platforms, CoVID-19, Engineering Education, WAC, Online Examination Platform, Artificial Intelligence

1. INTRODUCTION

Formal verification can reveal the unexposed defects in a safety-critical system. India declared a nationwide lock-down of 21-days on March 24, 2020, which was extended twice then after. Such a situation brought Indian academic institutions to a complete standstill [1]. The time was crucial; given the summer session from March to May usually signifies academic year-end bustling with semester-end examinations including knowledge and practical assessments. Uncertainty about semester-end examination was critical for final semester students who were about to graduate and hence full of aspirations about their future. Given the severity of the COVID-19 pandemic, a mass promotion was announced for school students, standard I to VIII, IX, and XI, who were not required to pass examinations conducted by the educational board [2].

Conducting end semester exams and mass promotion both were contested by different ideological groups for the students of higher educational institutions [3-5]. However,

a Private University in the state of Gujarat, India was determined to take the challenges posed by pandemic heads-on and ensure the academic cycle continues through the use of modern-day educational technologies for learning and assessment. As the student classes were put off since mid-March, academic teaching was gradually switching to distance learning mode. The real challenge was about conducting an examination amid the pandemic for about 28,000 students coming from various parts of India and internationally [6]. After due considerations, the University leadership decided to conduct online exams over the World Assessment Council (WAC)'s platform [7]. This was unprecedented, in terms of thought leadership at the University, as some of the major universities in the state of Gujarat were mulling norms for conducting online exams, and whether only for final semester students while giving mass promotion to the remaining students [8,9].

The decision to go along with online examinations and modified assessment pattern, as compared to traditional paper-based examination, was taken with due considerations about the checks and balances of such a

divergence. The anticipated advantages of online exams amid the pandemic situation was remote participation by students, saving paper and time, automated record-keeping for assessors, and immediate exam results [10]. Some of the anticipated challenges included the integrity of online exams given certain students may indulge in cheating or copying practices, availability of laptop and internet connectivity for students in remote areas, adequate and private space for appearing online exams [11]. However, the primary motivation guiding the timely conduct of online end semester exams was to ensure that the academic cycle shall sustain through the pandemic and students shall swiftly move on with their academic and professional careers. This paper is an attempt by engineering faculty members to share their experience with the process of online examination. The primary aim is to facilitate process documentation for the benefit of academic institutions in the developing world and ignite discussion around the use of technological platforms for online examinations and future assessment approaches.

2. METHODS

This paper is an attempt to document processes and experiential narrative by authors (AY and RG) who were involved in conduct of online examination, in collaboration with an author (KT) who is a research mentor at the University. We assume this documentation will serve the due purpose to fill the void that exists with regards to process documentation for the online examination preparedness and execution amid COVID-19 pandemic for STEAM (science, technology, engineering and math's plus arts) students in higher education institutions. It could be of specific value for higher education institutions in the developing world. The result section describes authors' personal experiences, observations, as well as perceptions narrated by their colleagues and students during the overall process from orientation to conduction of online examinations. The flow chart of the method used for this study is shown in figure 1.

3. RESULTS

The results section reports the processes followed, implementation challenges perceived, faced and tackled for conducting online examinations, during the pandemic, under the following sub-headings:

3.1 Planning for Online Examination

Top leadership at the University was concerned about getting student examinations done in time, especially for the final year students. The leadership started mulling available options for conducting online examinations with the imposition of lockdown in India, as early as End-March 2020. The technological leadership at the

University was assigned the task to mull available options and suggest the one suitable for the requirements of the University. After considering various online platforms for conducting higher education examinations, the leadership finalized to go ahead with the WAC's examination platform [7].
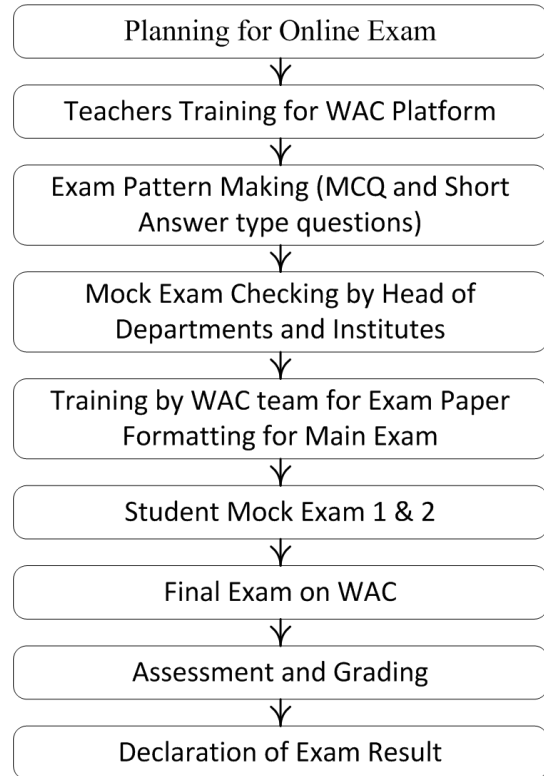
Figure 1 Process Flow Chart in Conduct of Online Examination

The examination department personnel responsible for conducting student examinations were oriented about the WAC platform through a five-day structured training at the beginning of April 2020. Lately, they began the task of assessing technological requirements given the number of subjects for which examinations shall be conducted, number of students appearing for each subject, and server capabilities of WAC. The WAC has provided dedicated onsite support executive for faculty orientation and technological support with regards to the functionality of its online examination platform. Internally, the examination department asked the head of institutions to formulate the institutional coordination groups with 2-3 faculty representatives. The Examination department of the University was responsible for communicating with various affiliated academic institutions about the design of exam papers, preparing them as per the formatting requirement of WAC, assessment and grading, and submission of exam results to the examination department of the University. To serve this purpose, WAC's onsite executive conducted repeated training of faculty members over the Google Meet platform.

3.2 Training of Teachers & Students

The WAC uses artificial intelligence (AI) based software especially for the assessment purpose. The university leveraged this for taking online end-semester examinations. Teachers underwent online training by the WAC team to get acquainted with the examination platform in April 2020. The training helped teachers get oriented with four access modes meant for (a) preparing examination paper with specific settings, (b) allowing login access to students on a given date and time as scheduled for the exam, (c) student portal and functions available to them, (d) administrative portal to be accessed by the WAC team. The training also focused on various options available to detect potential cheating behaviors by students during an examination. Such functions include proctoring, live audio & video feeds, deviation detections, amongst other features. Training also emphasized on achieving uniformity in examination pattern, for ease of administration and putting least possible stress on students amid pandemic times. This was not an easy mean to achieve, given the presence of 20+ faculties affiliated to the University, offering 100s of degree and diploma courses. Hence, the WAC team in coordination with the University's examination department conducted repeated trainings to address queries related to uniformity in exam patterns.

Once the exam papers were finalized and uploaded on the WAC platform, mock examinations were held for faculty representatives, head of the departments and head of the institutes to assess the ease of appearing an exam and feasibility of conducting semester-end exams for thousands of students. Once, these faculties gave 'okay' nod, two rounds of mock examinations were organized for students to help them get acquainted with the WAC platform, login requirements, accessing exam papers, switching between different sections of exam papers, submission of exam papers and accessing 'help,' in case of technical or other glitches while appearing examination. The difficulties faced by students were documented and effective steps were taken to overcome the same during final examination.

3.3 Conduct of Online Examination

The WAC servers have specific capacity to handle certain number of students at a given point of time. Hence, the examinations were scheduled in a way that no more than 85-90% of actual capacity of the student login to the WAC platform at any given time. Accordingly, several slots were scheduled over a period of eight to ten weeks for smooth conduct of the exams for about 28,000 students. Exams for engineering students were scheduled over a four-week period between mid-May to mid-June 2020.

3.4 Implementation Challenges & Solutions (Anticipated and Encountered)

3.4.1 Design of Exam Papers

To deal with the issues like unstable internet connectivity and completing required login formalities during examinations like filling the student details and switching from one section of the question paper to the another, students were allowed 30-minute additional time to appear exams in a stress-free manner. In subjects having mathematical theories like 'Theory of Computation,' 'Compiler Design,' 'Mathematics-I,' and 'Mathematics-II,' some questions needed calculations or writing a formula, which were perceived to be challenging to answer by typing an answer. Hence, provisions were made where students can write formula on paper and take image in front of the camera. Time duration for exams were decided based on consideration of such attempts and time required by students during the mock examination rounds.

3.4.2 Experiences during Mock Exam

Some of the issues encountered during mock examinations by the students included low or unstable network connectivity, especially for those appearing exams from remote villages. They were debarred from the examination given certain settings on the WAC platform, which debarred them given behaviors of leaving the place and attempting to login multiple times. The proctoring algorithm also recorded animal and bird sounds as violation of acceptable behaviors. However, some students were appearing examinations from remote areas, where they have to travel specific distance to ensure stable internet connectivity. Hence, such instances couldn't be considered as Unfair Means Cases and shall be allowed to appear exams. Measures were taken during final exams to ensure liberal settings in the proctoring functions.

Another major issue was unavailability of the desktop or laptop with students coming from low socio-economic strata. Also, some students left their laptop and books at the hostel, while returning to home due to lock-down, anticipating the situation will return to normal soon and they will be back to the college. Hence, some of the students were required to appear online exam using their smartphones and encountered problems which were not reported by students undertaking exams using laptop or desktop.

3.4.3 Experiences during Online Exam

Online examination was a new experience for almost everyone involved in planning, conducting and appearing examinations. Despite rigorous and repeated orientation to the WAC platform, the faculties were more than alert to handle any unwanted situation and facilitate students experiencing any technical glitch. Faculty representatives were assigned for specific group of students, for real-time

assistance during examination. Their contact numbers and emails were circulated to students well in advance. Even the WAC team was standby to provided needed assistance on real-time basis. Some of the issues reported by students included power failure and internet connectivity issues logging them out of exam portal. However, multiple logins were enabled as an anticipated troubleshoots for the same. Further, due to poor network connectivity sometimes when they submit the answers, they were not sure whether the response was recorded or not; so they used to call the faculty representatives for such issues. The faculty representatives were supposed to handle the students in the empathetic manner so as to ensure that the students don't face nervousness or unnecessary stress due to any technical glitch.

4. DISCUSSION

Contemplating about online examinations in March-end and conducting them by mid-May was a high-intensity exercise, especially for the University administration, examination department and faculty members of all affiliated academic institutions. Switching to online examination under the pandemic situation and trying to assess student knowledge with multiple choice and short answer questions, was nonetheless adequate. Also the impact of logistical challenges and cheating behaviors on students' exam performance is not fully understood and hence not discussed in this paper. This paper also does not discuss the practical skill assessment approaches, which is another limitation. However, online examination was one of the available choices to ensure the continuity of the academic cycle at the University, and for students who were able to continue their learning cycle or enter the professional job market.

Many academic stakeholders are contesting the integrity and validity of online examinations, and this has delayed the decision making processes at many of the Universities amid the closure of on-campus student activities, which are unlikely to resume before mid-October 2020 [8, 12, 13]. Recently, the judgment by the High Court of Karnataka, India ruled that the online examinations are not unreasonable or against the interest of students amid COVID-19 pandemic, while listening to a plea filed against the local College of Agrarian Sciences [14].

Covid-19 has posed critical challenges to the Educational sector world over, and at the same time it has acted as a catalyst to help leapfrog the sector with digital transformation [15-17]. However, the academic institutions in the developing world need to prepare adequately to deliver optimum digital learning experience. They need to begin with assessment of their information technology infrastructure, differences in academic disciplines, extent of hands-on skill and laboratory training, computer literacy, socio-demographic variables such as gender, remoteness, and economic capacity [18]. Blend of high-tech and low-tech solutions such as video proctoring, use of expert systems for randomization of questions, use of software to prevent access to other websites while logged in to exam portal, exam design with inclusion of more-demanding problem-solving questions, time restrictions per question could be some of the ways to ensure a reasonable level of integrity for online exams [11, 18, 19]. However, reasonable provisions shall also be in place to accommodate students who face internet connectivity issue and loss exam time due to technical failures [19]. In our case, such issues were anticipated and reasonable time was provided to ensure students can appear the exam without undue stress. As the digital education shifts the learning paradigm from hierarchical to distributed learning, future education research shall focus on design of learning activities that blend social, cognitive and facilitators approach and innovations in assessment practices [20,21].

5. CONCLUSION

Conducting online exams amid pandemic was certainly on the experimental basis, yet was very much warranted to sail through the challenges of current times. Authors anticipate that this documentation will provide insights to academic institutions in similar settings about the processes, challenges and brainstorming ideas to overcome anticipated challenges within given resources and other constraints.

6. AUTHORS' ROLE

AY is a faculty in the department of E&C at one of the engineering colleges of the University and was responsible for taking exams for the subject Digital Image Processing. He was involved in the design of the online exam format for the subject Digital Image Processing, which was appeared by final (8th) semester Electronics & Communication Engineering students. He underwent WAC orientation three times during the preparatory phase to get trained for design of exam format and assessment.

RG is a faculty in the department of Computer Science & Engineering (CSE) at one of the engineering colleges of the University and was responsible for taking exams for the subjects Artificial Intelligence and Soft Computing. He was involved in the design of the online exam format for Artificial Intelligence for 7th semester B. Tech. CSE students and Soft Computing for 2nd semester M. Tech. CSE students. He attended the same frequency of WAC orientation sessions as AY. In addition, he was assigned the responsibility to handle student queries during the online examination related to login and/or submission issues and technical or network related access issues.

KT brings considerable experience in pursuance and conduct of online courses since 2011. He has personal interest in distributed learning space, and sees innovations in education technologies as key drivers to transform the future of higher education. Given his training in qualitative research, he is well versed with documentation of

processes, observations and experiential narratives. He is a mentor for interdisciplinary and action research with the research department and also member of the University's core research committee.

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