Preparation for Online Learning in Higher Mathematics: A Case of Nepali Universities

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Abstract

Online learning is not just the substitution of the face-to-face mode of education for a virtual mode; it has its own philosophical and pedagogical foundations, so adequate preparation for effective online learning is crucial. This study examines the extent to which Nepali universities are prepared for online learning, focusing on learners' analysis, orientation activities and planning for online learning design. A descriptive qualitative research design was used in the study. Six students of mathematics and the same number of teachers of Mathematics, two teachers and two students from each three universities of Nepal were selected purposively for the interview and observation. The data collected from the interview and observation were analyzed using a thematic approach. The findings indicate that universities have a system of analyzing learners during admission through entrance examinations; however, the process was formalistic and focused on the content knowledge rather than assessing the required skills and attitude for online learning. Orientation activities familiarized the students with the online learning system, but were inadequate to provide individualized support. Additionally, planning for online learning was inconsistent and lacked transparency.

Keywords: instructional design, learner analysis, learning management system, mathematics, online learning

Introduction

Online education is intensely requires adequate preparation and planning of instructional design, and connecting the theories and models of online pedagogy (Adedoyin & Soykan, 2020). Online education has its own philosophical, pedagogical and practical foundation (Serdyukov, 2015), so preparation of the institution for a face-to-face system could not be compatible with an online learning system. This study focuses on analyzing the existing status of preparation of online learning based on the information obtained from students and teachers involved in the online learning system. Preparation includes analysis of learners, learning situations, institutional readiness, orientation activities and planning for instructional design.

Different models put preparation for online learning as the core component of the online instructional design. In the first phase of preparation, institutions and instructors should assess the existing learning environment, students' cognitive ability, technological competencies and availability and motivation to learning. The Analysis, Design, Development, Implementation and Evaluation (ADDIE) model puts analysis at the first step of instructional design (Budoya et al., 2019; Durak & Ataizi, 2016). Similarly, the learners, state objectives, select methods, media and materials, utilize media and materials, require learner participation and evaluate and revise (ASSURE) model focused on analyzing learners before instructional planning (Heinich et al., 2002). The instructional design for online learning (IDOL) model, proposed by Siragusa et al. (2007), comprised three hierarchical stages: analysis, strategy, and evaluation. All existing models focused on the analysis of learner and learning situation, pedagogical approach/ philosophy, learning content, instructional goal and the role of the educator.

Learners' Cognitive Level and Readiness Analysis

Effective preparation for online learning begins with a systematic analysis of learners' cognitive understanding of the upcoming courses, technological access and

competencies and readiness in learning. Particularly, two theoretical strands underpin learner analysis: cognitive levels to map students' knowledge and misconceptions regarding the subject matters and self-regulation to locate learners' metacognitive control, motivation and beliefs on their capabilities (Li & Traynor, 2022). The diagnosis of the cognitive level of students guides the design of orientation programmes integrating course guidelines and targeted technology supports, designing remedial lessons for the targeted group, and preparing learning tracks and learning strategies. While online readiness comprises five key dimensions as computer self-efficacy, self-directed learning, motivation, learner control and online communication skills (Hung et al., 2010). Analyzing the students' readiness is crucial in an online learning situation because learning readiness significantly influences student satisfaction and academic success in online learning (Yilmaz, 2017). Research findings suggest that promoting learner readiness through need-based support and orientation programmes can significantly enhance online learning experiences (Liu & Kaye, 2016). Therefore, learners' analysis before the semester plan is crucial to make the online learning system effective.

Orientation Activities

Orientation activities are the opening of the online learning process. Orientation activities should be designed to track the new students in the right learning path, increase motivation, reduce attrition, and build social presence in the online platform (Cho, 2012). Orientation activities could cover wide range of areas including academic skills (Moore et al., 2014), academic integrity in online learning system (Benson et al., 2019), motivation, guidance and counselling, mental health, violence and cybercrimes (Etherington et al., 2021; Uden et al., 2022) and information literacy (Ard & Ard, 2019; Marineo & Shi, 2019). Structured online orientation programmes that include sessions about the online learning system that cover the nature of the course, course expectations, entry competencies, assessment and evaluation mechanism, devices and required technological competencies, and feedback, monitoring and support system (Cho, 2012; UNESCO, 2021). Besides academic concentration, the sessions on guidance and counselling to increase motivation, maintain mental health, raise awareness on privacy and security in the online environment and protect from cyber bullying and crimes are found effective to increase students' readiness in learning (Jones, 2013; Liu, 2019). Moreover, sessions of the orientation programme should be designed to support the needy students regarding the use of technologies, processes to collaborate in an online classroom, submit an assignment, receive and react to feedback, and communicate with instructors and peers (Alperin et al., 2020).

Faculty readiness is also crucial for effective online learning, so, besides students' orientation, a faculty orientation programme is also necessary to make online teaching and learning activities effective (Alcaide-Pulido et al., 2025). Orientation for the faculties should focus on the university's online learning system, online instructional design, digital resource development, designing engaged and interactive learning activities, assessment system, feedback and support mechanism. Faculty orientation helps to maintain the uniformity in the online learning system, systematize the learning process and maintain the qualities of online education.

Institution's Preparedness for Online Learning

To be an effective online learning institution, institutions must be prepared based on digital infrastructure, human resources (academic and administrative) to handle the online learning system, support and monitoring mechanism, curriculum design and instructional planning, and quality assurance and accreditation procedures (Ramij & Sultana, 2020; Vishnu et al., 2024). Digital infrastructure is the foundation of online education (Joshi et al., 2024; Timotheou et al., 2023). It includes updated digital devices, reliable Internet access, a well-developed learning management system, a secure data center, and a user-friendly digital platform for online facilitation (Bates, 2019; Joshi et al., 2024; Martin et al., 2020; Timotheou et al., 2023). Competent faculties and online-friendly administration are equally important to set up a robust online learning system (Bozkurt & Sharma, 2020; Joshi, Adhikari, et al., 2023; Joshi, Khanal, et al., 2023; Khanal, Joshi, Adhikari, Khadka, et al., 2022). Moreover, institutions should develop assessment guidelines and quality assurance mechanisms to ensure credibility, authenticity, transparency, fairness and a valid assessment and evaluation system (JISC, 2020; Tinoca et al., 2014).

Instructional Planning in an Online Learning System

Online education requires adequate planning and design (Adedoyin & Soykan, 2020). How the online learning environment is set up in the system is crucial (Lopukhova & Makeeva, 2017). Since online education is a different system of education that has its own philosophical, pedagogical, and practical foundation (Serdyukov, 2015). Simply substituting digital communication tools for the delivery of the contents, as is done in the conventional modes of education, cannot work in the new forms of education, so the online learning system requires deliberate instructional planning (Bates, 2019). The constructive alignment of the components, like learning outcomes, learning resources, learning activities and learning assessment of instructional planning, is crucial for an online learning system (UNESCO, 2021). Teachers should have robust instructional planning that is transparent and accessible to the students for an effective online learning system.

Online Learning System: Nepali Context

Different policies and master plans proposed after 2000, such as Digital Nepal Framework-2000, Information and Communication Technology (ICT) in Education Master Plan 2013-2017, National Information and Communication Technology Policy, 2015, Policy, and Digital Nepal Framework-2019, have been prioritizing technology integration in education (Joshi et al., 2024; Joshi, Khanal,

et al., 2023). In higher education, the Open and Distance Education Centre (ODEC) under Tribhuvan University was established to conduct blended mode of education at the beginning and after the establishment of Nepal Open University online education system was institutionalized. The practices of the online education system spread after the outbreak of COVID-19 and universities in Nepal rapidly transferred their face-to-face mode of teaching and learning activities to an online mode. Different research done during COVID-19 showed that most of the higher institutions in Nepal had limited digital infrastructure (Laudari et al., 2021). Teachers and students have been facing problems due to poor internet connectivity (Paudel, 2021; Shrestha & Gnawali, 2021) and lack of institutional support (Laudari & Maher, 2019). The authority of the university and government had planned only for the period of transition. However, the impact of the Covid pandemic was prolonged and administrators, teachers and students realized that an alternative mode of the instructional system is required.

The rapid response to the new system of education could create significant operational and instructional complexities (Dhawan, 2020), yet these issues remain largely unexplored in the context of Nepal. In the context of limited empirical research on how online learning is being organized in Nepal's universities, this study has explored the existing situation regarding the preparation and planning of online learning.

Methods

This study employed a descriptive qualitative research design under an interpretive research paradigm (Creswell & Creswell, 2018). This is not a theory-driven research, so its focus is on the natural interpretation of the existing situation (Kahlke, 2014; Sandelowski, 2010) on the preparation and planning of the online learning system in Nepal.

Research Site and Participants

Three universities, namely, Tribhuvan University (TU), Kathmandu University (KU) and Nepal Open University (NOU) where the research sites of this reserch because these universities are leading universities in the field of open and blended learning systems. NOU was established to pursue education through online and TU and KU have also been conducting a few of their programs online or in blended modes. The participants of the study were students and teachers who were involved in the online teaching and learning activities at the time of research. Besides that, teaching subjects, teaching experiences, use of learning management systems, and existing conditions of teaching online were also considered as the basic criteria for teacher selection. Six students who completed at least one semester in online mode and six mathematics teachers, two from each university, who were involved in teaching and learning mathematics online, were selected purposively. Codes were given to teachers and students to maintain anonymity. For example, the teacher 1 from university one was coded as U1T1; likewise, the student was coded as U1S1.

Tools for the Data Collection

Interviews and observation were the tools to collect the data in this study. Among the most used interview techniques like structured interview, unstructured interview, non-directive interview, and focused interview (Cohen et al., 2018). I used a semi-structured interview combining the features of the structured and unstructured interviews. The interview was focused on the analysis of the students before the semester begins, the use of entrance examination results in instructional planning and design, communication and support mechanisms in online learning, and planning for the online teaching and learning process. Each interview was audio recorded for transcribing, translating and analyzing.

Like the interview schedule, observation is also another convenient tool in a qualitative study (Creswell & Creswell, 2018) during observation researcher can discern ongoing behavior as it occurs and avoid irrelevancies in the process of data collection (Cohen et al., 2018). For the observation, I have developed an observation guideline that supported me focus on the issue. The guideline was developed and finalized with the help of co-author and assessed by four experts. The guideline focused on analyzing the planning of teachers for online learning, the transparency of the online learning system, and the use of learning management system (LMS) for course orientation and planning. Only three teachers had developed LMS. So, LMS developed for Masters and MPhil. levels were observed with the help of observation guideline. To ensure the validity of the content of the interview schedule and observation guideline, an initial assessment was carried out using a modified Delphi method (Nasa et al., 2021) shared with the four concerned experts who were teaching mathematics online at a higher level. After that, I finalized the interview schedule and observation guideline, consulting with co-author and experts.

Data Analysis

Data were collected through interviews and observation. After an interview, the audio records were transcribed in the original language (Nepali) and translated into English. The translated transcripts were read and re-read several times to make sense of the ideas and concepts. I focused on the in-depth, contextual, and subjectivity of the collected data as advocated by Cohen et al. (2018). The data obtained from students' and teachers' interviews were managed separately. After having a clear understanding of the interview data, the important ideas and concepts in the interview transcripts were coded based on the meaning and relevance to the research questions. After giving the codes on each transcript, similar codes were grouped, categorized and given global themes. The data were analyzed using a thematic approach as suggested by Terry et al. (2017) following the steps, familiarizing data, reading and re-reading the data, generating codes, mana codes into categories and identifying broader themes. After

merging the codes into the themes, I examined the data, codes, and themes to ensure their connected networks. The data obtained from the observation was used to triangulate and cross-match the results of the interview to maintain the credibility of the findings. Discussion of each theme was developed based on the confirming and disconfirming results from the three sources of data.

Ethical Consideration

Ethical consideration in educational research is mainly concerned with the principles of respecting others' knowledge, values, quality of educational research, voluntary, informed consent, openness, and privacy (Cohen et al., 2018). At first, we took written permission from the Graduate School of Education to collect the data from different sources. I filled out the consent form to participate in the study, ensuring the voluntary participation of the respondents. The participants were informed that if they decided to withdraw or not participate, it would not affect their personal and professional lives. We were more cautious regarding the security and confidentiality of the identity, data privacy, and interaction between the researcher and the participants, and among the participants themselves as suggested by Cohen et al. (2018). We have not disclosed any identity of the respondents during data presentation, analysis and publication. We have not made any modifications or manipulations of the collected information.

Result and Discussion

This section discusses the research questions: "How does the pre-assessment (entrance examination) measure the students' cognitive knowledge, readiness and ICT competencies required in the online learning process?", "How effective are the orientation programmes conducted by the institutions to facilitate students in the online learning system?", and "How do the teachers plan for online teaching and learning? The major themes that emerged from the data were entrance examination, formal or practical, orientation programmes, supportive but insufficient, planning inconsistencies and issues of transparency. These major themes were the combinations of different sub-themes that are discussed under the major themes.

Entrance Examination: More Formal and Less Practical

The analysis of the prospective students for online learning can be conducted through pre-assessment. Pre-assessment in the form of an entrance examination helps to assess learners in terms of cognitive levels and readiness for learning (Bukhari, 2019). In our university's system, the major procedure of learners' analysis has been done through the entrance examination. So, I interviewed students and teachers regarding the process and usability of the entrance examination. The first sub-theme generated from the interview was assessing understanding as the primary focus of the entrance examination. The verbatim of students indicated that the questions asked in the entrance examination mostly focused on knowledge rather than skills. For example, the student from the M.Phil. level

mentioned that "the entrance exam was there, which was mostly focused on the understanding of principles and paradigms of research, educational psychology, philosophy of education, and mathematics education rather than skills to apply the concept in the research process" (U3S1). This indicates that the exam focused on understanding of the contents, which suggests some relevance to their field, but did not assess the skills to do research in mathematics education. Moreover, the inclusion of an ICT-related skills test was missing in the entrance examination. Student U3S2's voice indicates the same: "asking about a few tools used in the learning process cannot major the skills to use digital technology. There was no practical test to measure the ICT skills" (U3S1). Another student viewed "the test was just a formality" (U1S1), and questioned the purpose of the entrance exam, saying, "since everyone was eventually admitted, I wonder why the entrance exam was necessary" (U1S1), highlighting the concerns about the entry criteria in the teacher education programmes.

Less focus on the assessment of learners' readiness in online learning was another sub-theme generated from the interview. The focus of the entrance examination is on measuring the knowledge rather than attitudes in learning. Teacher U3T2 criticized the current entrance system as "this system is unable to cater to the needs of students who are not self-motivated and or engaged". The view of the teacher from university U1 indicates that cognition is the focused area rather than affection. Teacher U1T2 replied, "I didn't take any formal assessment, but I usually check the understanding level of the students in general by questioning some basic concepts. But I did not take any examination. I do not identify the student's level individually". This teacher did not mention any clues for measuring the readiness of the learners in the learning. So, the part of the affective domain is completely shadowed in the analysis of the learners.

Usability of the entrance examination's result was another sub-theme generated from the interview with teachers. The use of the entrance result is more for administrative purposes than academic. During the interview, teachers highlighted the importance of the entrance examination. They assured that the entrance examination can provide one level of understanding about the student's ability; however, only one respondent, teacher U2T1, explained the use of the entrance examination on planning and designing the course as, "in our university, we take entrance examination and the results are used to inform, modify and adapt the semester plan according to the level of students". On the other hand, the teachers from the remaining two universities mentioned the lack of usability of entrance examinations in the planning and learning design. The teachers from U1 were unaware of the entrance examination and its usefulness. The scenario of unawareness and detachment of teachers in the entry process of students indicates the weak coordination and communication mechanism between the systems of the institution. Teachers were unaware of the entrance examination taken by the Office of the Dean. This

view indicates the lack of a systematic process of analysis of learners in the learning process, and teachers were unaware of the cognitive and other backgrounds of students.

Moreover, teachers were asked about the role of the pre-assessment of students in planning. One teacher, U2T1, emphasized the role of pre-assessment "entrance examinations can be used in shaping the semester plan; however, the results are rarely used to modify the course contents and planning according to the students' abilities". Another teacher, U3T1, stated, "I understand the role of pre-assessment in planning and designing the lessons and assignments, but I do not take any formal pre-assessment beyond questioning the related concepts of the course before starting the lessons".

Knowing and doing are different aspects. Teachers have known the value of pre-assessment for planning of learning design, but they have not applied their knowledge in practice. So, from this discussion, it can be said that the entrance examination is taken as the formal process to enroll the students rather than to measure cognitive level, readiness and self-efficacy (Hung et al., 2010). This mixture of opinions indicates that there is a disconnection between the intended purpose of the entrance exam and its actual implementation, undermining its effectiveness in evaluating student readiness for the online learning environment.

Orientation: Supportive but Insufficient

The purpose of the orientation program is to disseminate the whole academic program, teaching and learning activities, assessment system, support mechanism of the institution, and other remaining activities (Mayhew et al., 2010; Zweig et al., 2022). Three sub-themes, orientation as a platform for understanding online learning mechanisms, support to socialization in the online environment and lack of need-based and individualized technical support, were generated from the interviews with teachers and students.

Students perceived orientation as the platform for familiarizing the online learning process. Student, U2S1 shared an experience where, "teacher taught us for a full day initially. Later, each subject teacher also provided guidance". However, most of the students pointed out the inconsistencies in the support. Among them, one student U1S2 stated, "one teacher gave us a brief guideline of online learning in the first semester, which helped to understand about online learning system to some extent, but that was not as comprehensive as it should have been". Students pointed out the positive aspect of the orientation programme, but questioned the activities integrated in the orientation. Student U1S1 said, "we were informed about the general course structure, learning tools and assignment schedules, but that was not very detailed and written form". These voices of the students indicate that orientation is essential and has worked to familiarize students in the online learning system (Ard & Ard, 2019; Marineo & Shi, 2019), but the existing orientation activities are not sufficient to make students online friendly. This indicates that the orientation activities did not cover the components

of academic, affective and technology as discussed by different literature (Benson et al., 2019; Cho, 2012; Etherington et al., 2021; Moore et al., 2014; Uden et al., 2022; UNESCO, 2021).

Orientation is the first activity conducted by the institution, where students get the opportunity to interact with colleagues and teachers. Students considered orientation as the starting point of the learning process. Student U2S1 shared, "we got opportunities to share our expectations, queries and learning in the whole group during the orientation, which helped me to be familiar with peers". Orientation activities helped students to develop feelings of classroom in an online environment. Student U3S2 shared, "before the orientation programme, I felt isolated and individual but after the orientation, I can contact my colleagues using different communication tools, for instance, we have a group in Messenger and we discuss our issues in Messenger." The versions of these students indicate that orientation can play the role as the gateway to collaborative and engaged online learning (Alperin et al., 2020). If we make our orientation program engaging and collaborative, then the upcoming learning process will be more engaging and collaborative (Jones, 2013; Liu, 2019).

Orientation programmes conducted in the institutions have helped to develop a conducive learning environment. But students viewed the existing orientation activities were inadequate to develop the skills needed for an online learning environment. Student U1S2 expressed, the department, so far, had run an orientation program. However, there was no such program organized by the department focusing on online students. There was no technical support for using the technology apart from what the subject teachers discussed about how to join for a couple of days, and what to do and not to do in class.

In the case of technical support, the existing orientation activity is inadequate and ineffective. Student U3S2 viewed, orientation was conducted, but that was short time, just one and a half hours with all students gathered online, making it difficult to address individual concerns. During the session, some issues were mentioned, but it wasn't until I encountered those problems myself, while trying to navigate the online system, that I realized how challenging they could be.

The student had to rely on external resources like YouTube tutorials. Both of the students from university U1 highlighted gaps in technical support; they viewed, "there were no teachers available to guide us, and the department never informed us about any technical support staff, and there was no such program organized by the department focusing on the online students". This lack of institutional support forced students to rely on their capacity, friends, and other websites if any problems arose.

These mixed experiences suggest that while some efforts were made to provide technical support, the overall orientation programs were insufficient to guide students throughout the semester. The orientation program could be

more helpful for the newcomer students (Ramij & Sultana , 2020; Vishnu et al.,2024)paving the way for equitable and inclusive education for all. Various studies have confirmed that use of tools technology in education would democratize access, personalize learning experiences, enhance engagement and promote learning opportunities.

Digital infrastructure is a critical enabler of educational technology tools. This study is such an attempt. It tries to systematically evaluate the digital infrastructure ecosystem, needed to advance technology in education. Specifically, the study tries to assess the status of digital infrastructure for online learning in higher education. We focused this study on India, which has the third largest higher education system in the world. A composite index was developed with the use of Principal Component Analysis (PCA but the existing orientation activities were inadequate to address the needs of the students. So, it is necessary to restructure the existing orientation activities integrating cognitive, technical and motivating components.

Planning: Inconsistencies and Issues of Transparency

As UNESCO (2021) suggested planning and designing the programs is an important stage among the five stages of the online learning system. After the interview with teachers and students, subthemes like inconsistency in structured planning, lack of transparent mechanism, limited use of LMS for planning and transparency and absence of clear online learning tracks were developed under the planning theme.

Again, I asked teachers about planning in the semester system. The responses of teachers and students indicated the inconsistency among the universities with regard to developing a structured plan before the semester begins. The teachers from U2 expressed clearly regarding the planning and they shared their LMS with a detailed semester plan. Teacher U2T1 shared, "planning is evolving in nature, and we are always committed to responsiveness and continuous improvement on our plan, adapting the curriculum based on the needs and levels of students". However, teacher U1T1did not explain clearly about planning activities. Teacher U3T2 shared, "we do not have a detailed semester plan, but we have a tentative plan on how and when we can complete the course". The voices of the students from the respective universities also matched with teachers' views. Student U3S1 said:

We didn't get any such pre-determined calendar. The general information regarding the teaching and learning system and assessment was obtained from the teacher; however, we did not participate in the planning activities. Another student, U1S2 mentioned, the teachers did not share any semester planning, but they discussed the assignments related to the subject, such as how many exams would be held, but they did not fix any date.

However, student U2S2 viewed it positively. In his own words "Each subject teacher had posted the semester plan, including internal assignments like presentation, written examination, and home assignment in the Moodle platform; however, we did ,ot participate in designing the planning". The views of students and teachers from different universities indicate the inconsistency in the planning activities.

The planning process is also related to the transparency of the university's system. The university, which had an LMS to conduct the learning activities, had developed the plan and shared it with the students through the LMS. Teacher U2T1 and U2T2 showed the semester plan and shared the view as, "the semester plan and assessment rubrics were shared with the students at the beginning of the semester". But the teachers from the remaining two universities refused to share their planning during the observation. The views of the students explained above verified this claim. Planning in the online semester system depends on the institution's policy. The institution that had the provision to share every activity and planning with the students had developed detailed planning. So, institutional policy is required to develop structured semester planning.

In addition to the information obtained from the interview with teachers and students, I observed the LMS of teachers to triangulate the information from different sources. I observed the LMS of those teachers who were involved in the interview and received some sort of training regarding LMS and Moodle for LMS. I requested to enroll me as a non-editing teacher in their courses. Only three teachers provided access to their LMS. It may be because other teachers did not have an LMS or did not want to share. During the observation, it was found that only three instructors' Moodle was in an updated form and only two instructors' Moodle included features of LMS. The observation report of the developed LMS regarding online course settings is presented in Table 1.

Table 1: *Course Setting, Planning and Orientation Information in LMS*

Course Setting	U2T1	U2T2	U3T1
Course Introduction	The LMS of the teacher contained the course introduction, course objectives, and course details.	Course introduction described in the homepage of Moodle with course objective	A short course introduction was mentioned in Moodle and the curriculum was also available in Moodle.
Learning Process	Only the weekly course plan was mentioned in Moodle but the clear learning process was not there.	Not clearly mentioned in Moodle	Not mentioned
Communication Channels	On the announcement page, there was a comment section, using these students and instructors can communicate with each other. Besides, instructors had developed WhatsApp, Viber, and Messenger groups for easy communication.	Different communication channels were used for communication with students and learners.	Not mentioned
Support Information	Not mentioned in the Moodle	Not mentioned in the Moodle	Not mentioned in the Moodle
Expectations, learning objectives, and assessment procedures.	The course objectives were mentioned in the course, the expectations from the learners were shared in the orientation sessions and the assessment procedure was mentioned in the orientation package.	Assessment rubrics were developed but the expectations of instructors and learners were not mentioned.	Not mentioned
Font styles, content layout, and organization	The font was suitable to read. The layout was not attractive and motivating to the students.	The font was suitable to read. The layout was not attractive and motivating to the students. Several learning materials were there without any description of the learning materials.	The font was suitable but the layout was not attractive to the students.

The focus of the LMS observation is to reveal the existing situation of planning and transparency of the online learning system to the students. The data obtained from the observation is presented on six constructs: Course introduction, learning process, communication channels, support information, clear expectations, learning objectives and assessment procedures, font styles, content layout, and organization. Table 1 shows the variation in the design of Moodle based on teachers. U2T1 had developed the most comprehensive course setting, whereas U2T2's was limited, and U3T1's was minimal and insufficient. The Moodle of U2T1 contained a detailed course introduction, a communication platform within Moodle, and external tools like WhatsApp, Viber, and Facebook Messenger. The home page (Dashboard) contained the course curriculum, course objectives, assessment process and grading criteria, and the semester plan. However, insufficient and lack of structured Moodle of other teachers can distract students from the learning tracks and create confusion about the learning process.

Since online education requires adequate planning and design (Adedoyin & Soykan, 2020). So, how the online learning environment is set up in the system is crucial (Lopukhova & Makeeva, 2017). The result obtained from the interview and observation shows that our online learning system lacked structured and consistent planning. An online learning system should be more transformative and reflexive in nature rather than a didactic and mimetic approach, as mentioned by Barefah & McKay (2016) and this is the many-to-many approach instead of the one-to-many approach, where the teacher is considered as a designer, facilitator, and mentor and students as co-designers or collaborators in the learning process and assessment is mostly based on the formative model (Barefah & McKay, 2016). However, from the findings, it is found that a lack of student involvement in any planning activities. Even the teachers themselves did not have structured planning. This hinted at the unpreparedness of teachers and the lack of flexibility and openness of the online learning system. However, some teachers developed their LMS and oriented students through Moodle, planned all the activities, and established clear communication channels. So, the teachers can make the online learning environment more effective, first, we should delete the misconception that digitizing the physical materials and taking classes using video conferencing tools is the online learning system (Joshi et al., 2023; Khanal et al., 2021, 2022) and institution (administration) should do more than just enroll the students, taking online classes and evaluating the students from paper and pencil tests is enough for the online.

Conclusion

The results of the study highlighted that Nepali universities have followed the key preparatory components for online learning, these efforts remain insufficient and inconsistent across the universities for ensuring effective and uniform online education in higher-level mathematics. The data revealed three major themes: analysis of learners,

orientation and planning. The attempt to analyze learners in the university during the admission process through the entrance is in practice, but it is largely a formality and limited to assessing content knowledge rather than assessing skills, attitudes, motivation and readiness towards learning. Orientation programmes conducted in the institutions help to familiarize with the online system, but are inadequate to offer personalized guidance and support for diverse learners. Furthermore, inconsistencies and a lack of transparency in the planning of online instructional design in mathematics undermine the uniformity of online learning implementation across universities. To strengthen the existing online and blended learning system, universities should adopt more comprehensive, inclusive and participatory preparation strategies that align with the pedagogical principles of online learning. The findings also indicate the inadequate institution's preparedness regarding analysis of learners, supporting learners and planning. So, institutions and their faculties should be more responsive to make the online learning system effective.

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Conflict of Interest

The authors have no conflict of interest.

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