Research Article

Problems and Issues Encountered in Teaching Science using Synchronous and Asynchronous Teaching Modalities

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Abstract: The pandemic has ushered a worldwide change in many sectors of the society including the field of education. As governments put into place policies to mitigate further spread of the COVID-19 virus, educational institutions moved towards digitalization of instruction, instructors were faced with problems and issues with regards to the application of synchronous and asynchronous modalities. Aside from that however, opportunities geared towards internationalization emerged.

This study identified these problems, issues and opportunities encountered by instructors in teaching science through the synchronous and asynchronous modalities. To achieve this aim, a hybrid technique for inquiry that combines quantitative and qualitative tools was utilized. Respondents included science professors and instructors of Isabela State University teaching during the Academic Year 2021-2022.

The respondents were interviewed on their experiences and insights and their responses tabulated, transcribed and analyzed according to the purpose of this study. Results indicate significant implications towards the internationalization of instruction and linkages of the university.

Keywords: Asynchronous teaching, COVID-19 pandemic, Digital literacy, Distance learning, Internationalization, Isabela State University, Synchronous teaching.

Introduction

With the coronavirus spreading rapidly across Asia, Europe, the Middle East and the United States, countries have taken swift and decisive actions to mitigate the development of a full-blown pandemic. In the past two weeks, there have been multiple announcements suspending attendance at schools and universities. As of March 13, the OECD estimated that over 421 million children are affected due to school closures announced or implemented in 39 countries. In addition, another 22 countries have announced partial "localized" closures [1].

The Covid–19 pandemic caused interruption in all sectors of the society producing a chain reaction of economic and psycho-social impacts affecting every Filipino citizen. For the Philippine higher education sector, the learning environment has been severely disrupted campuses were closed and face-to-face classes were suspended to protect the health and safety of students. But despite these interruptions, CHED ensured the continuity of learning by enjoining higher education institutions (HEIs) to implement flexible learning modalities [2].

The CHED Memo Order mandating flexible learning has led millions of students into temporary 'home-schooling' situations, especially in some of the most heavily impacted our country. These changes have caused a degree of inconvenience; but on a positive note, they have also prompted educational innovation. Although it is too early to judge how reactions to COVID-19 will affect

education systems around the world, there are signs suggesting that it could have a lasting impact on the trajectory of learning innovation and digitization [3].

Pursuant to the CMO No. 08 series of 2021, the Isabela State University implemented the Flexible Teaching and Learning Modalities (FTLM) which brings to our students to experience a combination of online and offline learning. Flexible Teaching and Learning Modalities (FTLM) should be the norm of our teaching minimizing in-campus presence of students and face-to-face learning.

Flexible Learning is a combination of both online and offline learning methodologies with the use of technology. Synchronous or online modality is when the students study with their teacher and classmates through an application that uses a webcam. Meanwhile, the asynchronous or offline modality is when the teacher provides the students with the lesson, seatwork or assignment in the module that they can finish at their own pace, within the deadline. All works are submitted and graded via online mechanisms.

The faculty set up their Group Chats as well as Video Conference via zoom, Google Meet, Microsoft meeting and LMS Platforms such Ed Modo, Google Classroom, Moodle, etc. as needed and necessary. The faculty also conducted initial meetings via video conferencing with their students based on their synchronized schedules issued by the Registrar or any convenient LMS platforms, to discuss with them the following: contents of the syllabus, course guide, policies and guidelines to be followed both online and offline classes, requirements and grading system. They also discussed the protocol for picking up assignments as well as the drop off locations for the submission of outputs.

In relation to the aforementioned, this study aims to provide awareness on problems and issues encountered by teachers in teaching general education subjects in online and offline teaching as well as determine strategies that they have employed in overcoming this problems and issues. Specific objectives are as follows: to determine the profile of respondents in terms of highest Educational Attainment), academic rank; years of teaching experience; to determine the problems and issues encountered by teachers in their synchronous and asynchronous classes; and to determine strategies employed or suggest ways to improve in overcoming such problems and issues.

Methodology
The use of multiple research methods and the use of a multiplicity of techniques are essential in conducting a research study. In consideration to this, both a descriptive and quantified description of the phenomenon were targeted for this study; hence, a hybrid technique for inquiry that combines quantitative and qualitative tools was utilized. The descriptive qualitative research design was used to determine the problems and issues encountered by teachers using synchronous and asynchronous teaching modality and to determine the strategies to overcome these problems and issues.

Teachers handling general education subjects for the Second Semester for the Academic Year 2021-2022. All interviewees had over 3 to 20-year teaching experience, and they have been teaching different science courses at the university for at least 15 years. The sample was evenly balanced for gender, and all participants were familiar with the university e-learning tool, Google classroom, Google meet and Zoom, Interviewees were selected based on their baccalaureate degree and field of specialization. All of the interviewees were from the different departments of ISU like College of Education (CEd) and School of Arts and Sciences (SAS).

Methods of Data Collection
Data was collected through a semi-structured interview of both face-to-face formats or via telephone call. The semi-structured interview comprises of two parts: the first part consists of questions with regards to the faculty's profile and the second consists of open-ended questions aimed towards determining the problems and issues that teachers encountered in their synchronous and asynchronous classes. Their strategies in overcoming said problems and issues were also discussed.

Interviews were conducted online through Zoom sessions. Each interview session was 1-15 minutes long, and data collection was completed by saturation—when the researcher perceives a feeling of closure is obtained with repeated answers. The interviews began with broad questions aiming to find out the professors' general evaluation of the online teaching, what motivated them to use the online tools, and what problems, if any, they experienced while using these tools. During the interview sessions, participants were asked to point out what they like/dislike in the online long distance teaching experience during the lockdown and suggest ways to improve it.

Interview sessions were recorded, transcribed, and manually coded through textual analysis. Following a systematic deductive approach of qualitative data analysis [4], the transcript of the collected data was reviewed to identify repeating patterns. Each pattern was then given a code. Relevant codes were combined into overarching themes, where themes are integrated to convey the story of the data in a logical manner.

4 science instructors, 1 assistant professor, 3 associate professors and 3 professors from different filed of specializations at Isabela State University Cauayan Campus in Cauayan City, Isabela, Philippines were the respondents of the study.

Methods of Data Analysis
Frequency and Percentage count was used to determine the profile of the teachers. The data from the interview was transcribed, coded, and thematically analyzed to determine the most prevalent problems that these faculty have encountered as well as the strategies that they have undertaken to overcome these problems.

Results and Discussion
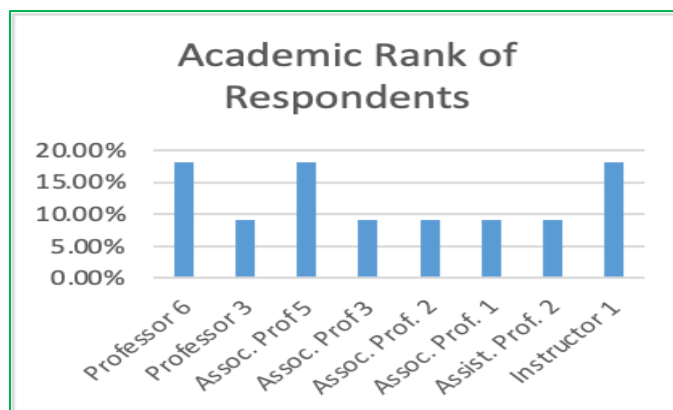**Profile of Respondents**
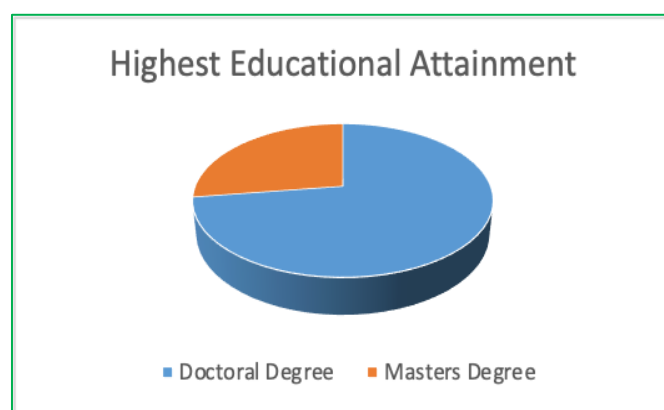
Figure 1. Educational Attainment of Respondents

The figure above indicates the educational attainment of the respondents. As perceived herein, a vast majority of the respondents have already attained their doctor's degree in education while a minimum have masters' degrees.

The Isabela State University, being one of the foremost higher educational institutions in the region, has always promoted and encourage professional development among its professors and this accounts largely for the number of instructors therein who have already earned their post-graduate degrees.

Encouraging postgraduate studies among higher education instructors is important as masters' and doctoral studies have been perceived as a means for bridging the world of research to the world of practice in teaching [5]. With this in mind, a teaching workforce with postgraduate degrees would translate to more innovation and development in the educational institutions.

Figure 2. Academic Rank of Respondents

Figure 2 shows the academic rank of the respondents of this study. As perceived herein, a majority of the respondents occupy the ranks of Professor 6, 5 and Instructor 1 whereas the others at 9 percent are ranked as Professor 3, Associate Professor 3, 2 and 1 respectively. The data indicates that the respondents, who teach in Isabela State University, consist of instructors and professors occupying varied ranks as accorded by the Faculty Merit System.

Ranking teachers in HEIs is practiced so as to ensure that they are qualified to perform the tasks and duties required by the educational institutions. Furthermore, just like the rationale behind the pursuance of postgraduate studies, academic ranking is perceived to be a process that promotes a research and publication-oriented teaching culture since the requirements for promotion through said ranks require instructors to engage and publish research, which in turn, benefits their universities [6].
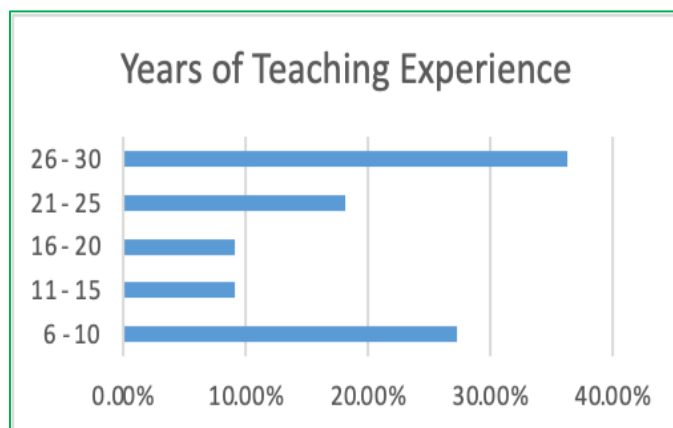
Figure 3. Respondents' Length of Service

The figure above reflects the respondent's length of service in the teaching profession. Data indicates that a majority of the respondents have already been teaching for 26 to 30 years. Meanwhile, the second largest number of respondents belong to the group with a 6-10 years of teaching experience. This may be attributed to the fact that the Isabela State University constantly upgrades its teaching workforce by hiring new instructors who show promise in helping the university achieve its aims. Meanwhile the large number of tenured teachers is also a great advantage for the university as experience is highly correlated to effectiveness. A review of studies has indicated that more experienced teachers are valuable in the workplace as they have the capability of guiding their younger colleagues towards effective work practices [7].

Problems and Issues in the Conduct of Synchronous and Asynchronous Classes
1. Poor internet connectivity
During the interview, several instructors and professors cited the poor and unreliable quality of internet connection as a major obstacle for not just for them but more so for their students who have

limited means for procuring both the technological tools and the money needed for accessing the internet. As Cullinan *et al.,* [8] stipulated, most students who reside in areas with poor broadband coverage are also most likely to be socioeconomically disadvantaged as well; hence they suffer more in accessing quality education during the pandemic. This problem is one of the pitfalls of the distance learning modalities that have been implemented during the pandemic. A study by Rotas and Cahapay [9] identified this as one of the difficulties cited by tertiary level students in the Philippines. Moreover, the connectivity is also affected not only by the unreliability of internet servers but also electric power interruptions which are common in the country. The same problem was also determined by Baticulon *et al.,* [10]. The poor internet connectivity impacts online lectures as it diminishes the quality of instruction received by the students. Furthermore, said problem is most detrimental during assessment tasks such as quizzes and online exams as mentioned by the respondents.

2. Limitations on learning experiences
Because the current setup of instruction in ISU is a combination of both synchronous and asynchronous modalities, the time for real-time instruction is limited. Specifically university mandate assigned a maximum 40-minute weekly session for each subject which would mean that an instructor would only 'meet' students online for real-time lectures in their subject once a week. This has proven to be a difficult adjustment for students who are experiencing this kind of learning setup for the first time. It proved to be most detrimental for low-performing students as they are deprived of the support mechanisms which are usually provided in face-to-face classes. Remediation is also more difficult as monitoring and scaffolding can be tricky given the lack of real-time interaction between teachers and students.

In addition to the aforementioned, all the respondents agreed that one of the main disadvantages brought about by pandemic is the cancellation of in-campus activities and the postponement of students' off-campus training and internships. The respondents stipulated that although they understood why this is being done, they are also aware that it decreases the educational experiences of students especially with regards to on-the-job training and internships. The same situation was also perceived in other educational institutions all over the world. This is considered as a problem especially for skill-based courses such as Hotel and Restaurant Management which capitalizes on internship and on-the-job training programs for students to practice and master job-related skills [11].

3. Blurring of Work-Life Balance
Another issue cited by the respondents is the difficulty of keeping the balance between work and personal matters especially since they are spending most of their work at home. One respondent complained that "teaching and working from home increased working hours and interfered with the family life."

As work-from-home setups have become the norm for many teachers and other employees during the pandemic, numerous studies have also explored the impact of said arrangement on the people involved. Similar to what was cited by the respondent of this study, findings from Palumbo [12] also showed that the overlapping of work duties and personal matters at home creates fatigue. While there are also positive effects of the work-from-home setup, the International Labor Organization [13] cautions against the psychosocial risks associated with working at home such as isolation, blurred boundaries between work and family and even the increased risk of domestic violence.

Opportunities and Best Practices for Addressing Issues in Synchronous and Asynchronous Teaching Modalities
1. Exploration and Utilization in Digital Literacy
A majority of the respondents stipulated that their experience in synchronous and asynchronous teaching has broadened their perspectives and expertise in instruction especially with regards to the utilization of communication and information technology. One respondent stated: "There has been a

greater advantage than ever communication between professors and students using online chat, discussions and webinars done in online teaching." Aside from that, all faculty respondents also lauded the ease of conducting quizzes and examinations online since it facilitates faster checking and grade calculation. In comparison to the manual recording and transfer to the e-class record which was the protocol in the past, the bulk grading in platforms such as Edmodo is an advantage for teachers.

It is because of the aforementioned that one respondent stated: "Online education will be further accelerated and it will eventually become an integral component of higher education especially in time of unavoidable circumstances. So, we need an alternative mode of teaching as problems arise." Another respondent also stated thus: "a good opportunity for the university to upgrade its e-learning infrastructure; this includes enhancing Internet bandwidth, enlarging the capacity of data centers, purchasing licensed e-learning tools, and improving students and professors ICT skills to realize the mantra of the campus as Smart University in a Smarter City."

Likewise, Morales *et al.,* [14] stated that the situation during the pandemic has spurred a scenario of digital transformation and technological innovations in resources and methodologies. Whereas digital transformation has been happening for years even before the pandemic, the urgent needs brought about by the current situation has accelerated it in a matter of months and weeks as educational institutions reinvented their methodologies and services to keep operations running. Tejedor *et al.,* [15] also pointed out that it has become a necessity for educational institutions to ensure that teachers' digital skills are updated and enhanced; learning resources and teaching methodologies adjusted; and communication between universities and students be made appropriate to the current context. In addition, most of the respondents also suggested the use of innovative social network tools exclusively for university and campus officials during the pandemic to manage meetings between faculty members. As one of them explained, "This provided more participation in decision-making, transparency, speed of decisions and implementation" as need arise so that the operation of the school is not paralyzed or disrupted.

2. Ease of Access to Resources and Materials
The asynchronous aspect of instruction in Isabela State University has upgraded students' access to learning resources and materials as the respondents upload and share links of the recorded online lectures in podcasts or through YouTube. This enables students to play and replay instructional videos; to revise materials; and to focus on aspects of lessons they have difficulties on.

A downside that has been observed by the respondents however, is that it caused a "great decrease in students attendance in online synchronous classes, preventing students from class participation and interaction" which are still relevant for feedback and correction in case of misunderstandings and difficulties on the lessons. With this, the respondents stated that they find it necessary to motivate and encourage their students to still attend synchronous classes regularly for the aforementioned reason. As stated by Coman *et al.,* [16], it is essential that teachers are available to students even during distance learning and that they encourage students to engage in synchronous sessions so that problems and issues about the learning process can be addressed.

Conclusion
Based on the aforementioned findings of the study, it is perceived that the COVID-19 Pandemic has spurred the innovation of education in Isabela State University given the movement of instruction from the traditional face-to-face modality towards flexible learning via synchronous and asynchronous modalities.

The findings revealed the challenges, opportunities and practices encountered by the professors during the application of the new teaching methodologies and these are perceived to be significant for the improvement and enhancement of the university's instructional delivery to students. This is

especially vital as the trends in education is already aimed towards the direction of digitization and distance learning. Notably, CHED has already started moving towards the internationalization of Philippine higher education since 2016 and has specified distance learning as an appropriate, efficient and effective system of delivering quality higher and technical educational nationally and transnationally.

In light of this, Isabela State University has already partnered with foreign universities for collaboration such as the Leiden University in Netherlands, Maejo University and Rajamangala University of Technology Thanyaburi in Thailand and Singapore Polytechnic: all of which have implemented student exchange programs with ISU. As the university has already implemented distance and flexible learning modalities during the pandemic which have been found to be promising, it is likely that these can be enhanced and developed for the future when the university forays further towards internationalization.

Recommendation
In light of the findings and conclusions of the study, the researcher recommends the following:

1) Support should be given to instructors both in technological infrastructure and in digital literacy skill enhancement. This includes investment on the enhancement of internet bandwidth, improvement on the capacity of data centers, the purchase of licensed e-learning tools, and the provision of training for students and professors on necessary IT skills. Effective and responsive IT technical support and troubleshooting services may also be provided to students, especially during quizzes and exams. Support can be offered 24/7 through phone calls, e-mail, online live chat, and video guides.

2) Developing and maintaining robust communication channels between higher education management, students, and teaching staff are essential in keeping all stockholders informed and aware of next steps hence multiple informational and introductory online sessions should be maintained. Developing and maintaining robust communication strategies with staff, faculty, and students are essential in keeping all entities informed and apprised of the next steps in the transition, training, and ongoing support.

3) On the part of the instructors, strong effort should be made to design online courses rather than moving face-to-face materials of a course into the online environment. Interactivity and feedback should be emphasized during the online classes to increase students' attendance, where virtual chat rooms and forums for students-to-students and students-to-instructor online interaction should be designed. There should be clear instructions concerning exams, quizzes, and assignments to inform learners of how to get help and how to place petitions.

Conflicts of interest: There is no conflict of interest of any kind.

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